Public Utilities Commission

# Site Permit Application for a Large Wind Energy Conversion System
# Black Oak Wind Farm

Stearns County, Minnesota

Prepared for Black Oak Wind LLC and Geronimo Wind Energy LLC

Prepared by:
HDR Engineering, Inc.
701 Xenia Avenue South,
Suite 600
Minneapolis, MN 55416

HDR

GERONIMO WIND ENERGY

# BLACK OAK WIND FARM

Stearns County, MN

December 3, 2010

Dr. Burl Haar
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

**Re: In the Matter of a Site Permit Application for a Large Wind Energy Conversion System for the Black Oak Wind Farm in Stearns County, Minnesota**

Dear Dr. Haar:

Please find attached the Site Permit Application (Application) for a Large Wind Energy Conversion System for the Black Oak Wind Farm in Stearns County, Minnesota. This Application is being submitted via the Commission's efiling system by Black Oak Wind, LLC, an unregulated wholly owned subsidiary of Geronimo Wind Energy, LLC. of Edina, Minnesota.

Black Oak Wind, LLC seeks a Site Permit authorizing construction of up to a 40 Megawatts (MW) Large Wind Energy Conversion System for the Black Oak Wind Farm. Associated facilities will include gravel access roads, an electrical collection system, project substation, permanent meteorological towers, SODAR or LIDAR unit, and an operations and maintenance building.

No confidential information is included in the Application. Therefore only a public version is being electronically filed. I will have hard copies of the Application delivered on December 6th, 2010. Please send us an invoice for the filing fee.

Sincerely,

Patrick Smith
Director of Environmental Planning
(952) 988-9000

cc: Ms. Deborah Pile – Minnesota Office of Energy Security

# *Public Utilities Commission*
# *Site Permit Application for a Large*
# *Wind Energy Conversion System*

## Black Oak Wind Farm

## Stearns County, Minnesota

***Prepared for:***

GERONIMO WIND ENERGY

**December 2010**

***Prepared by:***

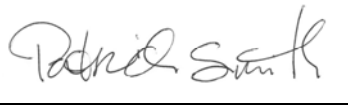
HDR

**HDR Engineering, Inc.**
701 Xenia Ave S, Suite 600
Minneapolis, Minnesota 55416

**Applicant:** **Geronimo Wind Energy, LLC**

**Address:** 7650 Edinborough Way, Suite 7250
Edina, MN 55435

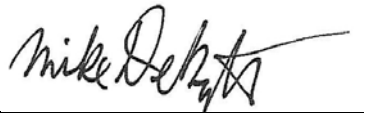
**Authorized Representative:** **Patrick Smith**

**Signature:** 

**Phone:** **952-988-9000**

**Email:** **patrick@geronimowind.com**

**Preparer of Application:**

**Signature:** 

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# List of Acronyms

| Acronym | Definition |
|---|---|
| AADT | Annual Average Daily Traffic |
| AMSL | Above mean sea level |
| BBS | Breeding Bird Survey |
| BGEPA | Bald and Golden Eagle Protection Act |
| BMP | Best Management Practice |
| BWSR | Board of Water and Soil Resources |
| CON | Certificate of Need |
| CRP | Conservation Reserve Program |
| dB | decibel |
| dBA | A-weighted decibel |
| dBC | C-weighted decibel |
| DNR | Department of Natural Resources |
| DOC | Department of Commerce |
| DOE | Department of Energy |
| EC | Environmental concern |
| EMF | electromagnetic field |
| ESA | Environmental site assessment |
| ESA | Endangered Species Act |
| FAA | Federal Aviation Administration |
| FCC | Federal Communications Commission |
| FEMA | Federal Emergency Management Agency |
| GWE | Geronimo Wind Energy, LLC |
| IBA | Important Bird Area |
| kV | Kilovolts |
| kW | kilowatts |
| $L_{eq}$ | Equivalent continuous sound level |
| LGU | Local government unit |
| LIDAR | Light Detection and Ranging |
| LWECS | Large Wind Energy Conversion System |
| MBBA | Minnesota Breeding Bird Atlas |
| MBTA | Migratory Bird Treat Act |
| MCBS | Minnesota County Biological Survey |
| MDH | Minnesota Department of Health |
| MISO | Midwest Independent System Operator |
| MPCA | Minnesota Pollution Control Agency |
| MPUC | Minnesota Public Utilities Commission |

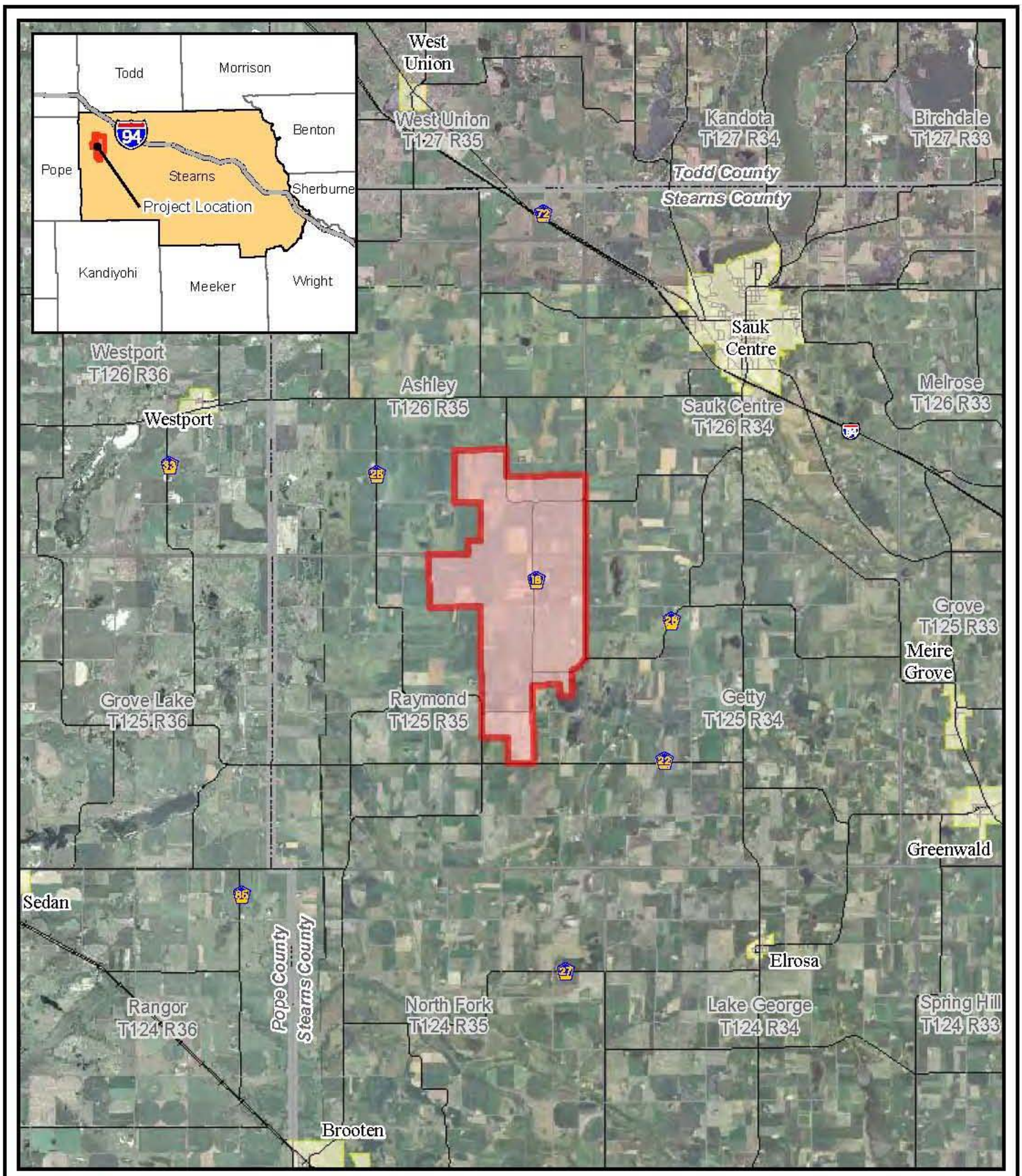
| Acronym | Definition |
|---|---|
| MSL | Mean sea level |
| MT | meteorological towers |
| MW | Megawatts |
| NCDC | National Climatic Data Center |
| NHIS | Natural Heritage Information System |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resource Conservation Service |
| NWI | National Wetland Inventory |
| NWR | National Wildlife Refuge |
| O&M | Operations and Maintenance |
| OES | Office of Energy Security |
| PLS | Public Land Survey |
| PPA | Power purchase agreement |
| PUC | Public Utilities Commission |
| PWI | Public Waters Inventory |
| RD | rotor diameter |
| RIM | Reinvest in Minnesota |
| RSEA | Regionally Significant Ecological Area |
| SCADA | Supervisory Control and Data Acquisition |
| SCS | Site Characterization Study |
| SHPO | State Historic Preservation Officer |
| SNA | Scientific and Natural Area |
| SODAR | Sonic Detection and Ranging |
| SWPPP | Stormwater Pollution Prevention Plan |
| TI | Turbulence intensity |
| TNC | The Nature Conservancy |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| WCA | Wetland Conservation Act |
| WECS | Wind Energy Conversion System |
| WMA | Wildlife management area |
| WPA | Waterfowl production area |
| WRA | Wind resource area |
| WTGAC | Wind turbine Guidelines Advisory Committee |

# 1.0 APPLICANT INFORMATION

Black Oak Wind, LLC (Black Oak Wind or Applicant), an unregulated, wholly owned subsidiary of Geronimo Wind Energy, LLC (GWE), is submitting this application for a site permit to construct and operate the Black Oak Wind Farm (the Project) to the Minnesota Public Utilities Commission (PUC). The proposed Project is a Large Wind Energy Conversion System (LWECS), as defined in the Wind Siting Act, Minnesota Statutes Chapter 216F. The Project is located in Stearns County, Minnesota (Figure 1-1).

Black Oak Wind will develop, design, construct, own, and operate the Black Oak Wind Farm. Black Oak Wind plans to begin construction of the Project in third quarter 2011. Black Oak Wind reserves the right to sell or assign the Project to another qualified entity at any time before, during, or after the Project is constructed, pending the appropriate approvals by the PUC. Black Oak Wind will construct and own all equipment up to the point where the Black Oak Wind Transmission Line connects to the high voltage side of the busbar at the interconnection substation. GWE or its subsidiary will obtain an interconnection agreement with the appropriate transmission owners and Midwest Independent System Operator (MISO) to support the Project.

GWE is a Minnesota-based wind energy developer with a focus on building projects in the Upper Midwest. GWE prides itself in strong community relationships, having built two Community Based Energy Development-certified wind farms, the Odin Wind Farm near Odin, Minnesota, and the Marshall Wind Farm near Marshall, Minnesota. Additionally, it is currently developing the Paynesville Wind Farm which is also located in Stearns County. GWE and its subsidiaries strive to partner with community members to meet common goals while constructing new wind energy generation sources that benefit the state and the region. GWE is committed to using Minnesota's wind resource wisely and efficiently, as is consistent with the State of Minnesota PUC and statutory objectives. GWE has evaluated and will continue to evaluate the site to optimize its wind resource while avoiding and minimizing impacts to human and natural environments.


Todd
Morrison
Benton
Pope
Stearns
Sherburne
Project Location
Kandiyohi
Meeker
Wright
West Union
West Union T127 R35
Kandota T127 R34
Birchdale T127 R33
Todd County
Stearns County
Sauk Centre
Westport T126 R36
Ashley T126 R35
Sauk Centre T126 R34
Melrose T126 R33
Westport
Grove T125 R33
Meire Grove
Grove Lake T125 R36
Raymond T125 R35
Getty T125 R34
Greenwald
Sedan
Pope County
Stearns County
Elrosa
Rangor T124 R36
North Fork T124 R35
Lake George T124 R34
Spring Hill T124 R33
Brooten
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Project Boundary
Cities
Townships
Figure 1-1
Project Vicinity Map
Black Oak Wind Farm
Stearns County, MN
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# 2.0 CERTIFICATE OF NEED

A Certificate of Need (CON) is required for a large energy facility greater than 50 megawatts (MW) (Minnesota Statutes §§216B.2421 and 216B.243, subd. 2, and Minnesota Rules Chapter 7849). Black Oak Wind proposes an energy facility of up to 40 MW and therefore a CON is not required for this Project.

Black Oak Wind has not yet determined who will ultimately purchase the Project's output; however, once the final determination is made, Black Oak Wind may choose to negotiate a power purchase agreement (PPA) with the purchasing utility. Alternatively, if it is commercially advantageous to sell the energy in the wholesale market, Black Oak Wind may opt to offer the Project's output for sale directly to wholesale customers, including Minnesota utilities and cooperatives.

# 3.0 STATE POLICY

The contents and treatment of applications for LWECS site permits are governed by Minn. Rule 7854 under the Wind Siting Act. In this application, Black Oak Wind presents information required by Minn. Rule 7854. Additionally, sufficient Project design, wind resource, and technical information are provided for a thorough evaluation of the reasonableness of the Project Area as a location for the Project.

The Wind Siting Act requires an application for a site permit for an LWECS to meet the substantive criteria set forth in Minn. Stat. § 216E.03, subd. 7. This application provides information necessary to demonstrate compliance with these criteria and Minn. Rule 7854. The siting of an LWECS is to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minn. Stat. § 216F.03). Black Oak Wind is designing the Project to comply with the PUC's wind turbine setback and siting guidelines. In addition, this application has been organized to meet the requirements of the Minnesota Department of Commerce Office of Energy Security-Energy Facilities Permitting (OES) guidelines for site permitting of LWECS.

# 4.0 PROJECT DESCRIPTION AND OVERVIEW

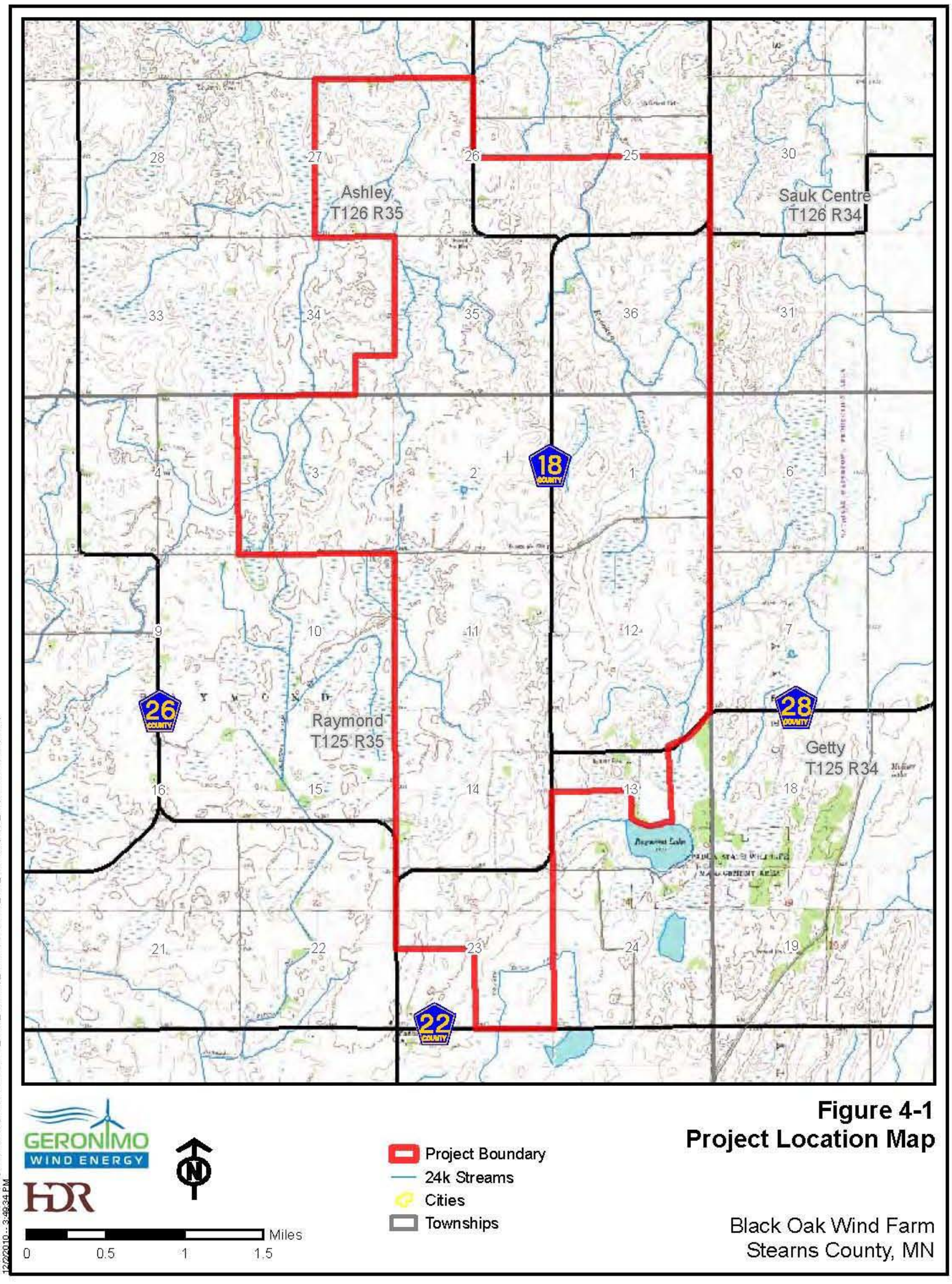
The Project will be up to 40 MW in nameplate capacity, consisting of up to 26 wind energy generators and will likely go online in second quarter 2012. Black Oak Wind has not made a final selection of wind turbine generators for the Project. Black Oak Wind proposes to permit the Project for a range of wind turbines sized from 1.6 to 3.0 MW. The application uses three turbine models to span the spectrum of typical turbine designs in that range (see Table 5-3 in the next chapter). Associated Project facilities include gravel access roads, a step-up substation, an electrical collection system, an Operations and Maintenance (O&M) building, permanent meteorological towers, and a Sonic Detection and Ranging (SODAR) unit or Light Detection and Ranging (LIDAR) unit.

The proposed site is located near Sauk Centre in Ashley and Raymond townships in Stearns County, Minnesota (Figure 4-1). Table 4-1 identifies the townships and sections within the project boundary.

**Table 4-1. Project Location – Stearns County, MN**

| Township Name | Township | Range | Section |
|---|---|---|---|
| Ashley | 126N | 35W | 25-27, 34-36 |
| Raymond | 125N | 35W | 1- 3, 11-14, 23 |

The Project boundary encompasses approximately 7,064 acres. Approximately 6,565 acres are under site control (93 percent of the area within the Project boundary).The Project's preliminary site layout for up to 40 MW (based on the General Electric (GE) 1.6xle 1.6 MW, the Vestas V90 1.8 MW, and the Vestas V112 3.0 MW turbine models) is shown in Figure 4-2 , Figure 4-3, and Figure 4-4, respectively. The final number of turbines will be based upon the specific turbine model selected. The preliminary 40 MW layouts shown in Figure 4-2 through Figure 4-4 are based on 26 GE 1.6xle 1.6 MW wind turbines, 23 Vestas V90 1.8 MW turbines, or 14 Vestas V112 3.0 MW turbines. These turbine models are discussed in Section 5.1. No alternate locations are proposed; final turbine locations will be determined based upon the results of biological and archaeological field surveys, and setback requirements resulting from the final turbine selection. Black Oak Wind is planning to install two permanent meteorological towers with the potential for a SODAR or LIDAR unit, and is currently operating two temporary meteorological towers within the site (Figure 4-2 through Figure 4-4).


Ashley
T126 R35
Sauk Centre
T126 R34
Raymond
T125 R35
Getty
T125 R34
Project Boundary
24k Streams
Cities
Townships
Miles
0
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1
1.5
Figure 4-1
Project Location Map
Black Oak Wind Farm
Stearns County, MN
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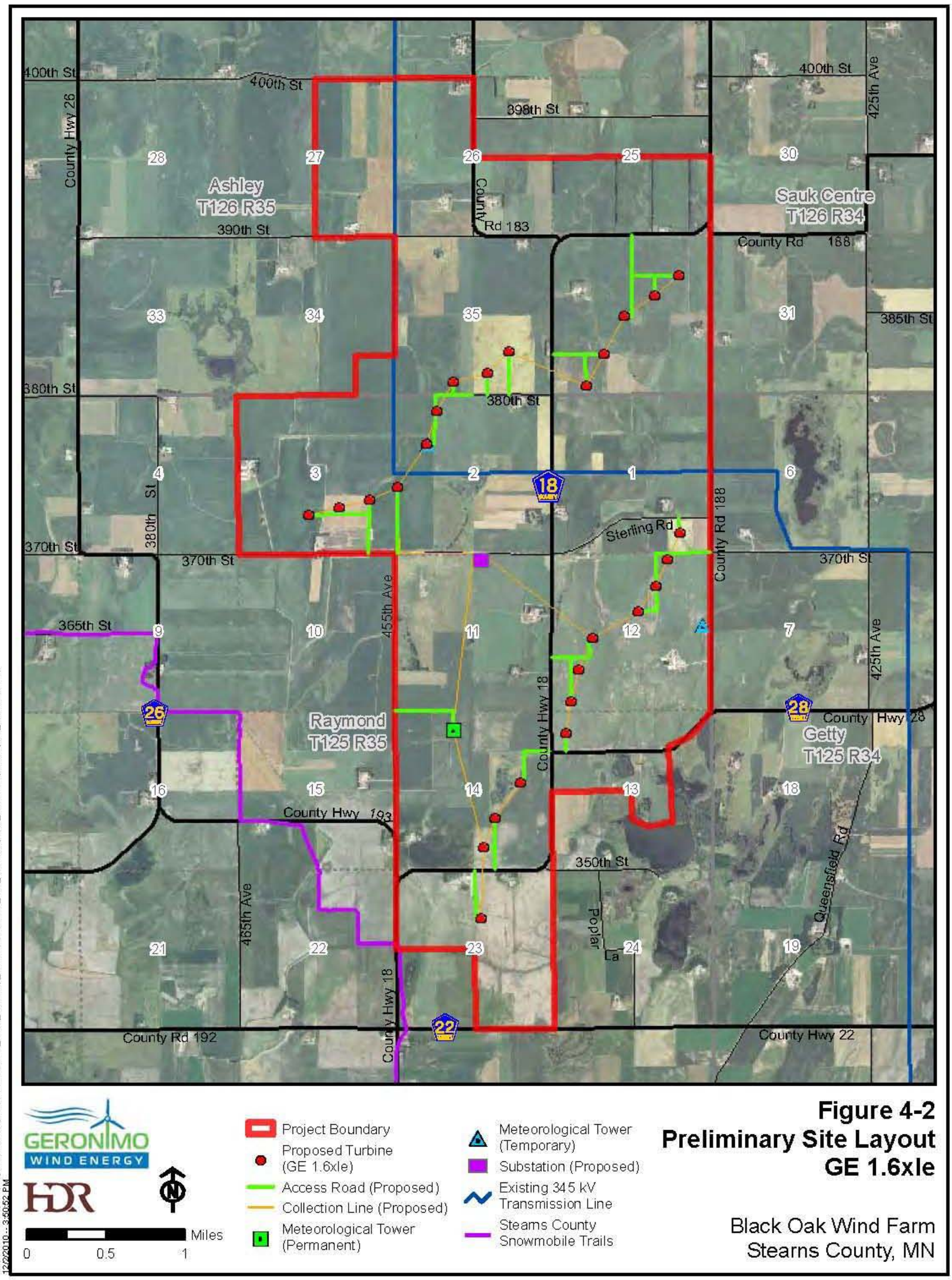
400th St
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27
26
25
30
Ashley
T126 R35
390th St
398th St
County Rd 183
Sauk Centre
T126 R34
County Rd 188
425th Ave
33
34
35
31
385th St
380th St
4
3
2
1
6
18
370th St
Sterling Rd
365th St
9
10
11
12
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455th Ave
Raymond
T125 R35
25
28
County Hwy 28
Getty
T125 R34
16
15
14
13
18
County Hwy 193
350th St
Queensfield Rd
21
22
23
24
19
Poplar La
County Hwy 22
County Rd 192
Project Boundary
Proposed Turbine (GE 1.6xle)
Access Road (Proposed)
Collection Line (Proposed)
Meteorological Tower (Permanent)
Meteorological Tower (Temporary)
Substation (Proposed)
Existing 345 kV Transmission Line
Stearns County Snowmobile Trails
Miles
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Figure 4-2
Preliminary Site Layout
GE 1.6xle
Black Oak Wind Farm
Stearns County, MN
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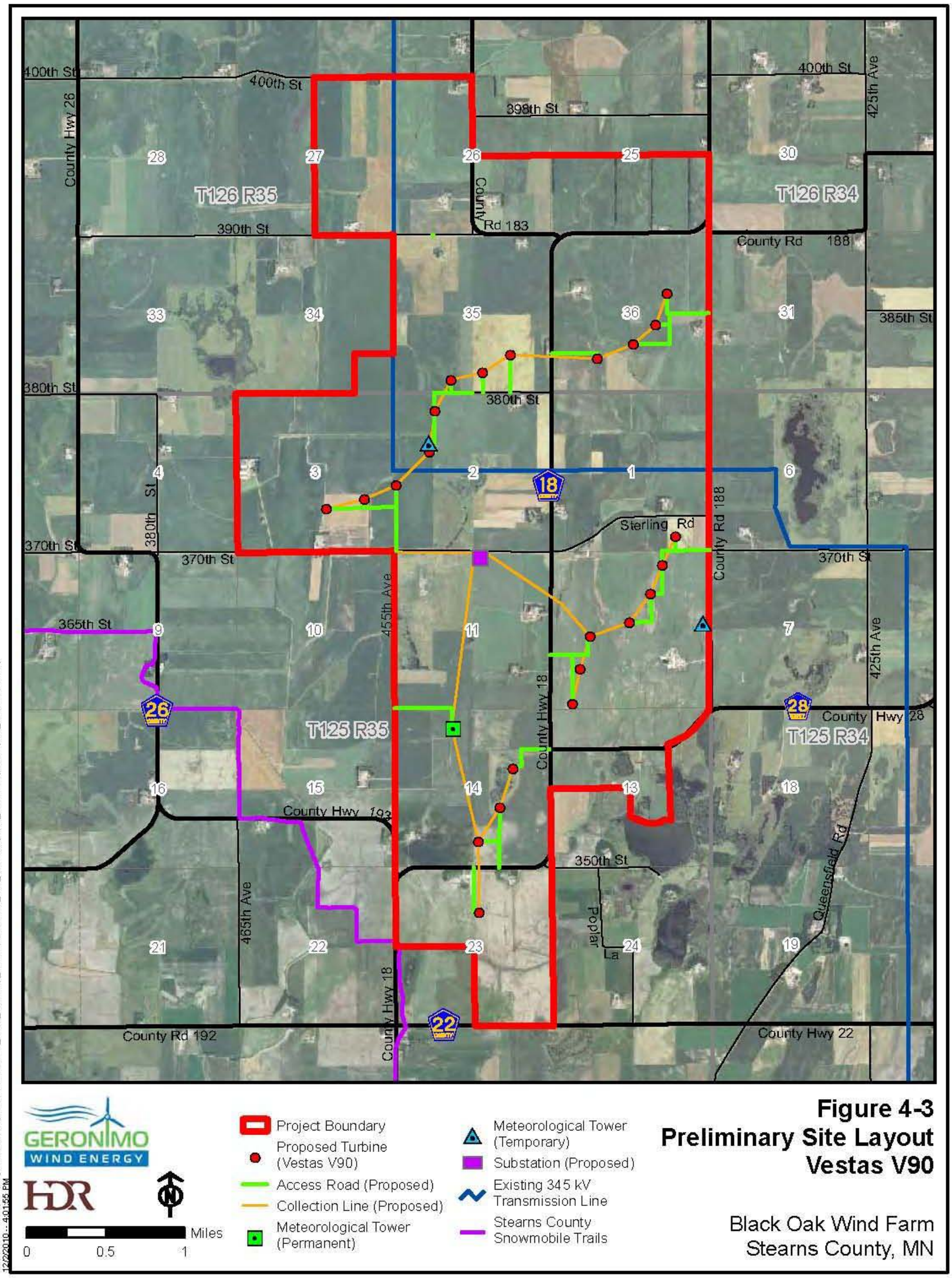
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455th Ave
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T125 R35
T125 R34
County Hwy 18
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County Hwy 193
350th St
Queensfield Rd
21
22
23
24
19
Poplar La
465th Ave
County Rd 192
County Hwy 22
Project Boundary
Proposed Turbine (Vestas V90)
Access Road (Proposed)
Collection Line (Proposed)
Meteorological Tower (Permanent)
Meteorological Tower (Temporary)
Substation (Proposed)
Existing 345 kV Transmission Line
Stearns County Snowmobile Trails
Miles
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GERONIMO WIND ENERGY
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Figure 4-3
Preliminary Site Layout
Vestas V90
Black Oak Wind Farm
Stearns County, MN
Map Document: (\\mpe-gis-file\GISProj\Geronimo\113816_Black_Oak\map_docs\mxd\LWECS_Site_PermitFig4-03_PreliminarySiteLayout_VestasV90.mxd)
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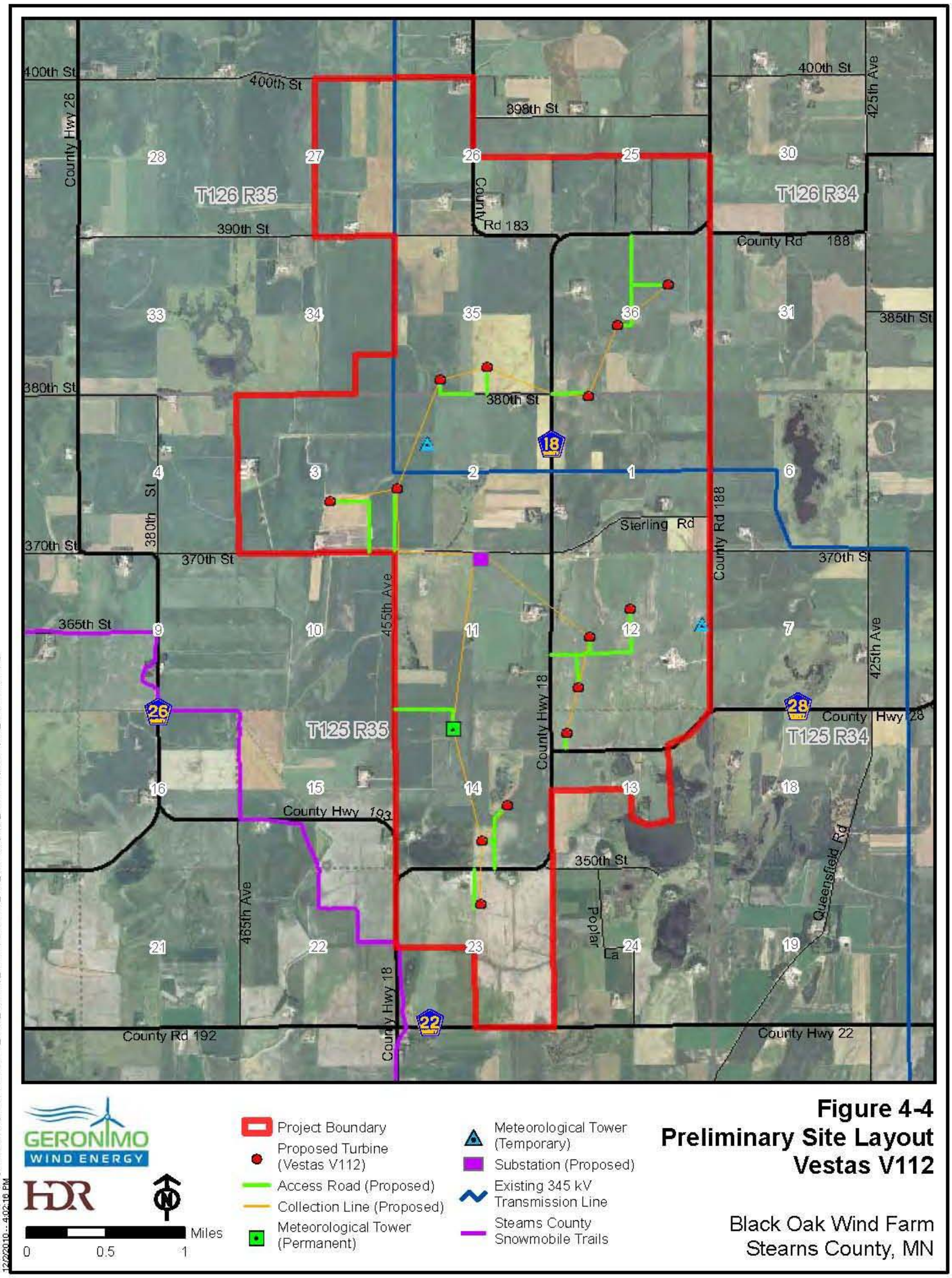
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370th St
455th Ave
365th St
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425th Ave
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T125 R35
T125 R34
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County Hwy 28
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14
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County Hwy 193
350th St
Queensfield Rd
Poplar La
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County Rd 192
County Hwy 22
22
Project Boundary
Proposed Turbine (Vestas V112)
Access Road (Proposed)
Collection Line (Proposed)
Meteorological Tower (Permanent)
Meteorological Tower (Temporary)
Substation (Proposed)
Existing 345 kV Transmission Line
Steams County Snowmobile Trails
Miles
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Figure 4-4
Preliminary Site Layout
Vestas V112
Black Oak Wind Farm
Stearns County, MN
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# 5.0 PROJECT DESIGN

## 5.1 DESCRIPTION OF LAYOUT

The wind turbines and associated facilities will be sited primarily on agricultural land. The site is comprised of approximately 84 percent cropland, 14 percent grassland, 1 percent aquatic/wetland, and 0.75 percent forest/shrubland. The topography of the site, the selected turbine model, impacts to area residents, and PUC setback requirements will dictate turbine spacing. Descriptions of the proposed turbine models are provided in Section 5.2. The differences in turbine models will influence the final location of each turbine.

Black Oak Wind will create a site layout that maximizes the energy generation of the project while minimizing impacts to the land and surrounding community. Wind turbine setbacks are based on the siting guidelines from the OES. OES wind turbine siting guidelines identify the minimum setback from residences as 500 ft, or the minimum distance required to meet the state noise standard of 50 dBA, whichever is greater. Section 6.59 of the Stearns County Zoning Code requires a setback of at least 750 ft from occupied structures. In general, GWE has a policy of siting turbines at least 1,000 ft from residences, unless other arrangements have been made with specific residents. In the event that other arrangements are made with respect to turbine setbacks, all turbines will be setback at least 750 ft (per Stearns County Ordinance) plus the distance required to comply with the MPCA limit of a 50 dBA nighttime L50 noise level. Noise data for each turbine model described in Section 5.3 demonstrates that GWE's setback of 1,000 ft would exceed the distance required to meet the 50 dBA noise level setback for all turbine models.

A 250 ft setback from all public and private rights-of-way has been incorporated, which adheres to both OES and County ordinance setback standards. All turbines will be located a minimum of five rotor diameters (RD) from the Project perimeter and non-leased properties in the prevailing wind direction (generally the northern and southern edge of leased areas) and three RD in the non-prevailing wind direction (generally the eastern and western edge of leased areas) to accommodate disruption of the normal wind flow and protect the wind rights of non-participating land owners. Similarly, internal turbine spacing will be at least 5 RD prevailing and 3 RD non-prevailing, with no more than 20 percent of the project turbines closer than the prescribed setback. Table 5-1 reflects the differing setbacks based on rotor diameter for the types of turbines under consideration for the Project.

**Table 5-1. Minimum Turbine Spacing Distances**

| Turbine Description* | Prevailing Perimeter Setback | Non-prevailing Perimeter Setback | Residences | Public Roads and Trails |
|---|---|---|---|---|
| | 5 RD (ft) | 3 RD (ft) | 1,000 ft minimum** | 250 ft minimum |
| 1.6 MW Turbine with 82.5 m RD | 1,353 | 812 | 1,000 | 250 |
| 1.8 MW Turbine with 90 m RD | 1,476 | 886 | 1,000 | 250 |
| 3.0 MW Turbine with 112 m RD | 1,837 | 1,102 | 1,000 | 250 |

**The listed RDs provide the range of rotor sizes; depending on the final turbine selection, the RD could vary slightly from the listed values, but would remain between 82.5 m to 112m.*

*** Although OES guidelines require a minimum of 500 ft from residences plus the distance necessary to meet State noise requirements, Black Oak Wind commits to a minimum 1,000 foot setback plus the distance necessary to meet the State noise requirements (County ordinances have a 750 ft setback which may be used in this Project if arrangements are made with residents and MPCA noise limits are met). All other setbacks in Table 5-1 are based on OES wind siting guidelines and County ordinances.*

Additional turbine siting considerations and an approximate schedule for determining these factors are included in Table 5-2.

**Table 5-2. Turbine Siting Considerations and Approximate Schedule**

| When Resolved | Issue | Expected Resolution Schedule | Siting Consideration |
|---|---|---|---|
| Items resolved during the Minnesota PUC permitting process | Exclusion areas | At issuance of permit | All exclusion areas in the application are those proposed by Black Oak Wind and are based on environmental and existing infrastructure constraints |
| | Setbacks | At issuance of permit | All setbacks in the application are proposed by Black Oak Wind and are based on the MPUC and OES's guidelines as well as Black Oak Wind's commitments |
| Items not dependent on the MPUC permitting process but potentially resolved within the 6 month permitting timeline | Turbine type | Once turbine purchase negotiations are Complete | Siting turbines is based on<br>A) Manufacturer specs and standards,<br>B) Turbine Interaction within the wind farm microclimate, etc. |
| | Final leased land boundary | Once final lease and easement negotiations are complete with land owners | Black Oak Wind will not site turbines on unleased properties and will observe a wind rights buffer from unleased property lines, as shown in Table 5-1. |

| When Resolved | Issue | Expected Resolution Schedule | Siting Consideration |
|---|---|---|---|
| | Title clearance | After site control is complete | Black Oak Wind will site turbines on leased land that has been properly cleared using Subordination, Non-Disturbance and Attornment agreements and consent forms from appropriate parties. All signed land is to be insured through a title insurance policy. Black Oak Wind will not site turbines on non-participating landowner properties. |
| Items resolved after the MPUC permitting process | Energy optimization | After all final leases and setbacks requirements are complete | Wind energy will be optimized by considering the turbine interaction with the site's microclimate and internal spacing between turbines within the wind farm. |
| | Geotechnical analysis | After all other field surveys and turbine micrositing are complete | Geotechnical soil borings will be conducted at the location of final turbine placement to determine the soil suitability to support turbine foundations. |
| | Wetlands | All wetlands and waters within the construction limits of project facilities will be delineated prior to construction. State and/or federal permits for unavoidable impacts must be obtained before any work occurs in those areas. | Permanent impacts to wetlands/waters subject to state and federal jurisdiction will be avoided or minimized as practicable. |
| | Cultural | Surveys of all areas with proposed ground disturbance will be surveyed for cultural resources after the preliminary layout is developed. | Cultural resources identified within the proposed construction areas and existing known resources in the area will be avoided as feasible. If avoidance is not practical, additional investigation of the resource may be needed and further discussion with regulating agencies would be necessary. |

## 5.2 DESCRIPTION OF TURBINES AND TOWERS

### 5.2.1 WIND TURBINE DESIGN AND OPERATION

A wind turbine generally consists of a nacelle, hub, blades, tower, and foundation. The nacelle houses the generator, gear boxes, upper controls, generator cabling, hoist, generator cooling, and other miscellaneous equipment. The hub supports the blades and connecting rotor, yaw motors, mechanical braking system, and a power supply for emergency braking. The hub also contains an emergency power supply to allow the mechanical brakes to work if electric power from the grid is lost. Each turbine has three blades

composed of carbon fibers, fiberglass, and internal supports to provide a lightweight but strong component. The tip of each blade is equipped with a lightning receptor.

The tower supports the nacelle, hub, and blades. The tower houses electrical, control, and communication cables and a control system located at the base of the tower. Towers may include lifts for use by Project personnel. Towers are tubular in design and are painted a non-glare white. Electrical equipment at the base of each tower conditions the generated electricity to match electric grid requirements. The expected tower foundation will be a spread foundation design., Except for approximately 18 inches that will remain above-ground to allow the tower to be appropriately bolted to the foundation, the remainder of the tower foundation will be located below ground.

The wind turbine blades convert linear energy from wind into rotational energy. An anemometer and weather vane located on the turbine nacelle continuously sense wind speed and wind direction. The hub and nacelle are constantly being rotated to match wind speed direction. Yaw motors rotate the blades to optimize blade angles in relation to wind speed and direction. The hub transfers mechanical force from the blades to the shaft connecting the hub to the gear box located within the nacelle. The mechanical braking system, located within the hub, locks the blade rotor to prevent the blades from spinning during maintenance periods or other times when the turbine is out of service. The gear box adjusts shaft speeds to match the required generator speed. Electricity is produced by the generator and transmitted through insulated cables to the power conditioning unit, known as a pad-mount transformer, located at the base of the tower.

### 5.2.2 TURBINE MODEL SELECTION AND TYPES

Black Oak Wind will finalize a turbine type for the Project as construction time nears in order to ensure the selection of the most cost effective, available, and optimal design for the site. The turbines Black Oak Wind is considering for the Project span the energy production range of 1.6 MW to 3.0 MW. The GE1.6xle 1.6 MW turbine is representative of the 1.6 MW class, the Vestas V90 1.8 MW machine is representative of the 1.8 MW class, and the Vestas V112 3.0 MW turbine is representative of the 3.0 MW class. Black Oak Wind may select a different turbine model than those specified; these three turbines are only used to represent the spectrum of available designs for the energy production range specified. Turbine hub heights would range from 80 to 100 m (262 to 328 ft) and the RD would range from 82.5 to 112 m (270 to 367 ft). Table 5-3 shows the range of characteristics for the three representative turbines. A diagram of wind turbine features is presented in Figure 5-1.

**Table 5-3. Wind Turbine Characteristics**

| Characteristic | Turbine | | |
|---|---|---|---|
| | GE 1.6xle 1.6 MW | Vestas V90 1.8 MW | Vestas V112 3.0 MW |
| Nameplate capacity | 1,600 kilowatts (kW) | 1,860 kW | 3,000 kW |
| Hub height | 80 m (262 ft) or 100 m (328 ft) | 80 m (262 ft)<br>95 m (312 ft) | 84 m (276 ft) or<br>94 m (308 ft) |
| Rotor Diameter | 82.5 m (270 ft) | 90 m (295 ft) | 112 m (367 ft) |
| Total height[1] | 121 to 141 m (397 to 463 ft) | 125 to 140 m (410 to 459 ft) | 140 to 150 m (459 to 492 ft) |
| Cut-in wind speed[2] | 3.5 meters per second (m/s) (7.8 mph) | 3.5 m/s (7.8 mph) | 3 m/s (6.7 mph) |
| Rated capacity wind speed[3] | 14 m/s (31.3 mph) | 12 m/s (26.8 mph) | 12 m/s (26.8 mph) |
| Cut-out wind speed[4] | 25 m/s (56 mph) | 25 m/s (56 mph) | 25 m/s (56 mph) |
| Maximum sustained wind speed[5] | Over 37.1 m/s (83 mph) | Over 45 m/s (101 mph) | Over 42.5 m/s (95 mph) |
| Wind Swept Area | 4,657 $m^2$ (50,127 $ft^2$) | 6,362 $m^2$ (68,480 $ft^2$) | 9,852 $m^2$ (106,046 $ft^2$) |
| Rotor speed | 9 to 18 rpm | 9.3 to 16.6 rpm | 6.2 to 17.7 rpm |

*[1] Total height = the total turbine height from the ground to the tip of the blade in an upright position*

*[2] Cut-in wind speed = wind speed at which turbine begins operation*

*[3] Rated capacity wind speed = wind speed at which turbine reaches its rated capacity*

*[4] Cut-out wind speed = wind speed above which turbine shuts down operation*

*[5] Maximum sustained wind speed = wind speed up to which turbine is designed to withstand*

## Turbine

Table 5-3 provides details on the hub height, RD, and wind speed operation parameters for the GE 1.6xle 1.6 MW turbine, the Vestas V90 1.8 MW turbine, and the Vestas V112 3.0 MW turbine. All three models have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive-train design where all nacelle components are joined on common structures to improve durability.

All proposed turbine models have Supervisory Control and Data Acquisition (SCADA) communication technology to control and monitor the wind farm. The SCADA communications system permits automatic, independent operation and remote supervision; allowing the simultaneous control of the wind turbines.

Operations, maintenance, and service arrangements between the turbine manufacturer and the Applicant will be structured to provide timely and efficient operations and maintenance. The computerized data network will provide detailed operating and performance information for each wind turbine. The Applicant will maintain a computer program and database for tracking each wind turbine's operational history.

Other turbine specifications include:

- Rotor blade pitch regulation
- Gearbox with three-step planetary spur gear system

- Double fed three-phase asynchronous generator (GE 1.6xle 1.6 MW), a six-pole asynchronous with variable speed generator (Vestas V90 1.8 MW and Vestas V112 3.0 MW) and a permanent magnet generator (Vestas V112 3.0 MW)
- A braking system for each blade and a hydraulic parking brake (disc brake)
- Yaw systems that are electromechanically driven

Some of the turbines being considered also incorporate new technology compared to turbines currently in the landscape, including:

- Force-flow bedplates (nacelle components joined on a common structure to improve durability)
- New gearbox bearing designs (improving reliability by reducing bending and thrust)

**Rotor**

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. Complete technical characteristics for each turbine model can be found in Table 5-3.

**Tower**

The towers are conical tubular steel with a hub height of 80 to 100 m (262 to 328 ft). The turbine tower, where the nacelle is mounted, consists of three to four sections manufactured from certified steel plates. Welds are made with automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Within the tower, access to the nacelle is provided by a ladder connecting four platforms and equipped with a fall arresting safety system.

## 5.3 DESCRIPTION OF ELECTRICAL SYSTEM

Construction of the Project will add up to 26 wind turbines, each potentially with a pad-mounted transformer at its base and both an underground and aboveground electrical collection system, including an occasional aboveground junction box that will deliver power to the Project substation. The power delivered to the substation will be converted to 69 kilovolts (kV) and will then be transmitted to the interconnection substation where it will enter the grid.

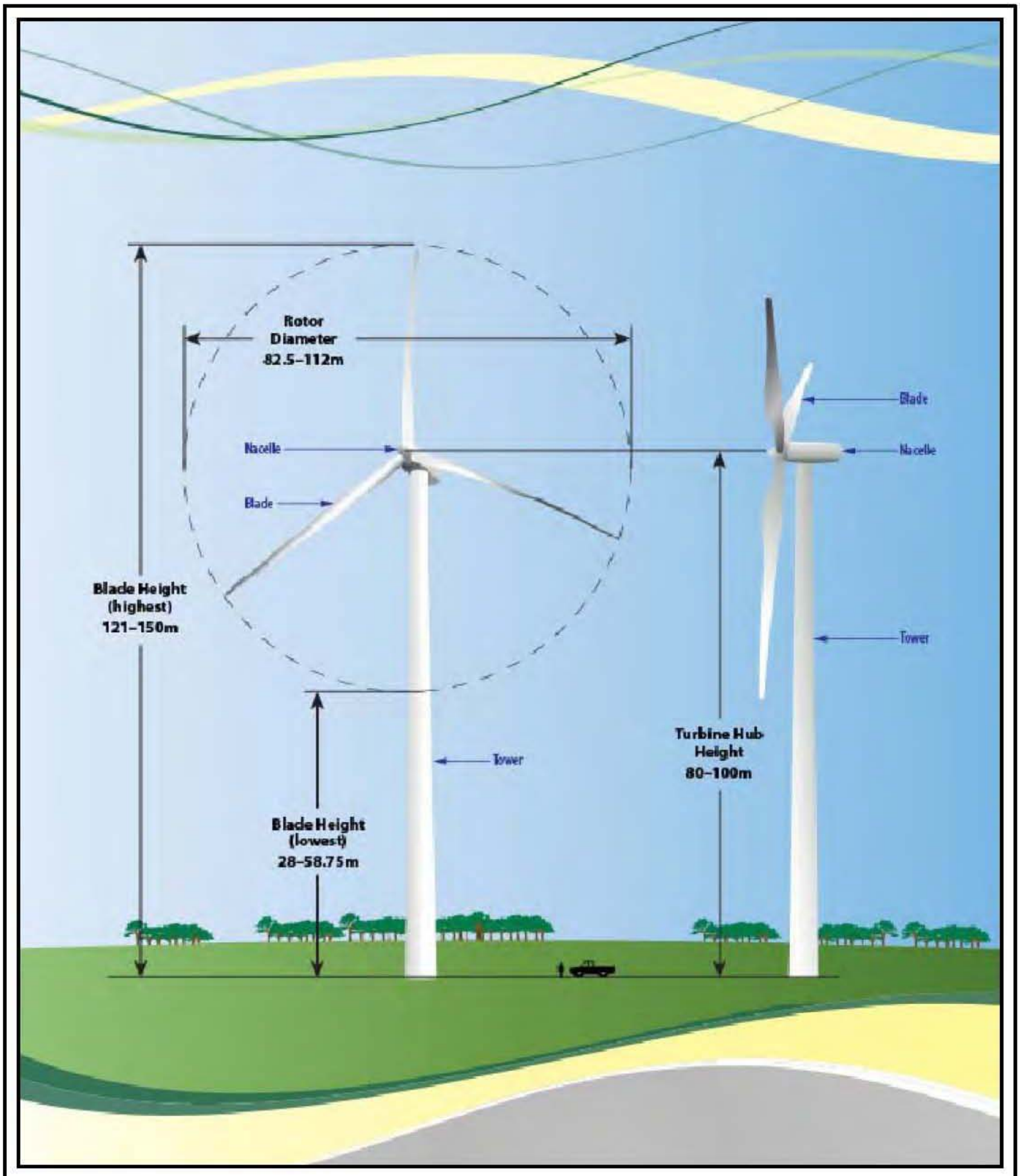


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**Figure 5-1**
**Wind Turbine Design Features**

Black Oak Wind Farm
Stearns County, MN

# 6.0 DESCRIPTION AND LOCATION OF ASSOCIATED FACILITIES

There are a number of facilities that will be constructed to support the operation of the wind turbines and facilitate the delivery of the electricity to consumers. Black Oak Wind seeks permitting approval from the PUC on the following associated facilities: permanent meteorological towers and other weather data collection systems, electrical collection system, and O&M building. Black Oak Wind will seek appropriate permits at the local level for the following associated facilities: access roads, Project substation, and the transmission line. As construction approaches, Black Oak Wind may exercise an option to seek permitting approval for an O&M building locally through Stearns County.

The project substation will require less than 1 acre of land within the project boundary. While the exact location of the substation has not been determined, it will be sited such that the length of the 69 kV overhead transmission line is minimized to the extent feasible. A potential location for the Project substation is shown on Figure 4-2 through Figure 4-4, at the end of Chapter 4. An overhead 69 kV transmission line is proposed to run from the Project substation along 370th Street and County Highway 28 approximately 4 miles to 395th Avenue, where it will run north approximately 1.5 miles to the point of interconnection at Great River Energy's (GRE) Black Oak Substation. The overhead transmission line from the Project substation to the GRE substation will be permitted through Stearns County. The described overhead transmission route is the preferred route alternative; the final route will be determined through the Stearns County permitting process.

Black Oak Wind's Interconnection request is with the Midwest Independent Transmission System Operator (MISO). This request has completed its facility study and is ready to negotiate the final details of its interconnection with MISO, a process that Black Oak may initiate at any time.

## 6.1 COLLECTOR LINES AND FEEDER LINES

At the base, or within the tower section of each turbine, a step-up transformer will be installed to raise the voltage to the power collection line voltage of 34.5 kV. In some turbines (Vestas V90 and Vestas V112), the transformer is located within the nacelle. If external transformers are used (GE 1.6xle), then small, concrete slab foundations will be constructed to support the transformers within the gravel area at the turbine base. The transformer is a rectangular steel box measuring approximately 2.3 by 2.6 m (7.5 by 8.5 ft). Support for the transformer is provided by a concrete pad or foundation approximately 8.0 in thick, which is placed over 0.6 m (2 ft) of concrete fill. The concrete fill will measure 2.3 by 4.1 m (7.5 by 13.5 ft) and will be placed under the transformer pad and between the transformer and the tower pedestal.

Power will run through an underground and/or aboveground collection system to the Project substation, which will raise the voltage to 69 kV. The electrical collection system will consist of a network of underground electrical cabling operating at 34.5 kV. Approximately 6 miles of underground lines will be installed by trenching, plowing, or where needed, directionally boring the cables underground. Generally, the electrical lines will be buried in trenches; however, because some granite bedrock outcrops are known to occur in the area, it is possible that short stretches of overhead line may be necessary to avoid conflicts with bedrock. Additionally, collector system cabling may go aboveground when conflicts with existing underground utilities, other infrastructure, or sensitive environmental conditions such as native prairie remnants cannot be resolved and still keep the line underground. At the public road at the edge of a farm

field, the power collection lines will either rise to become aboveground lines (if shallow bedrock, sensitive environmental conditions, or conflicts with underground utility or other infrastructure are encountered) or continue as underground lines. The collection lines will occasionally require an aboveground junction box when the lines from separate spools need to be spliced together.

Conceptual electrical layouts based on the preliminary turbine layouts are shown in Figure 4-2 through Figure 4-4. The interconnection details will be determined as a result of studies, discussions, and agreements with MISO.

## 6.2 ASSOCIATED FACILITIES

An O&M building will be constructed on or near the site and will provide access and storage for project maintenance and operations. The location of the O&M facility has yet to be determined, but it will be located so as to easily access the project. Construction of the O&M facility will require a building permit from Stearns County and/or the applicable township. The buildings typically used for this purpose are 3,000 to 5,000 sq ft and house the equipment to operate and maintain the wind farm. The parking lot adjacent to the building is typically 3,000 sq ft.

Currently Black Oak Wind is operating two temporary meteorological towers on the site. Black Oak Wind proposes to construct a permanent meteorological tower with the potential for a SODAR or LIDAR unit (Figure 4-2 through Figure 4-4). Black Oak Wind will also grade a temporary laydown area of approximately 6 acres, centrally-located within the Project Area, to serve both as a parking area for construction personnel and staging area for turbine components during construction.

## 6.3 PERMITTING FOR ASSOCIATED FACILITIES

The Applicant will be responsible for undertaking all required environmental reviews and will obtain all permits and licenses that are required following issuance of the LWECS Site Permit. Black Oak Wind will apply to Stearns County for a conditional use permit to construct the O & M facility and overhead transmission line.

# 7.0 WIND RIGHTS

Black Oak Wind has, or will obtain, land rights necessary to complete the project. Land rights may include, but are not limited to, wind turbines and project facilities, wind and buffer easements, access roads, transmission feeder lines on public roads, and land to mitigate environmental impacts. Black Oak Wind has approximately 6,565 acres of the 7,064 acres within the Project boundary (93 percent of the Project Area) under control either via leases or options, or under control by way of final negotiations on leases and options. This area is sufficient to accommodate the proposed facilities, required buffers, and turbine placement flexibility needed during siting to avoid natural resources, homes, and other sensitive features.

# 8.0 ENVIRONMENTAL IMPACTS

This section provides a description of the environmental conditions that exist within the Project. Consistent with PUC procedures on siting LWECS and with applicable portions of the Power Plant Siting Act, various exclusion and avoidance criteria were considered in selecting the Project Area.

## 8.1 DEMOGRAPHICS

The Project area is located in Stearns County. The 2000 population of Stearns County was 133,166 and the estimated 2009 population was 148,671. The Project is located in parts of Ashley and Raymond townships, where the estimated average household size in the year 2009 was between 2.71 and 3.44. The total estimated number of housing units in Stearns County in 2009 was 60,370.

The Project is located within a moderately-populated rural area in central Minnesota. According to the Stearns County Comprehensive Plan (Stearns County 2008), most townships in Northwest Cluster 1 (which includes Ashley and Raymond Townships) are experiencing slightly declining populations. Densities within 5 miles of the Project boundary range from 11 people per square mile in Bangor Township to 38 people per square mile in Sauk Center. For the townships within the Project boundary, Ashley Township has a density of 8 people per square mile, and Raymond Township has a density of 9 people per square mile. There are 23 homes within the project boundary (Figure 8-1 through Figure 8-3; all figures are located at the end of the chapter). There is no indication that any minority or low-income population is concentrated in any one area of the Project, or that the wind turbines will be placed in an area occupied primarily by any minority population.

### 8.1.1 IMPACTS

No impacts are anticipated.

### 8.1.2 MITIGATIVE MEASURES

No impacts are anticipated, and as such, no mitigation is necessary.

## 8.2 LAND USE

### 8.2.1 LOCAL ZONING AND COMPREHENSIVE PLANS

A comprehensive plan is a land use and community planning tool used to guide the direction and intent of growth for a municipality. Generally, comprehensive plans include elements on existing and future land use, population and housing trends, economic development, and environmental characteristics. In preparing this application, the Applicant has reviewed and analyzed the land use and other applicable elements of the most recently adopted comprehensive plans of the municipalities within and adjacent to the proposed Project Area. A list of the plans reviewed can be found in Table 8-1.

According to the *2030 Stearns County Comprehensive Plan* no change in land use is slated for any of the parcels located in the proposed Project Area. The existing land use is primarily designated as Agricultural/Woodlands with the exception of the eastern half of section 12 in Raymond Township. While this eastern portion of section 12 has a commercial land use designation, it is zoned A-160, meaning it is zoned for agriculture with a density of one unit per 160 acres. In addition, the Stearns County Future Land Use Plan classifies the said commercial area as agricultural. In any event, the proposed Project will not alter the land use or zoning classification of any parcel within or adjacent the Project boundary.

At the Township level, the A-160 zoning designation coincides with Ashley and Raymond Township's visions to limit residential growth, as stated in the Stearns County Comprehensive Plan. This zoning

designation is the most restrictive in terms of agricultural preservation and preventing the defragmentation of prime farmland within Stearns County. The Project is consistent with the intent to preserve farmland; a wind farm requires large amounts of open space, and farming operations are able to continue among the turbines. The Project will provide farmers and landowners with another source of income, and may prevent the need to subdivide and sell land.

Table 8-1 provides an inventory of municipalities within and adjacent to the Project Area, along with their respective comprehensive plans, if available.

**Table 8-1. Comprehensive Plan Inventory for Local Governments within Project Boundary**

| Governing Body | Name of Plan | Year Adopted | Associated Development Plan(s) |
|---|---|---|---|
| Stearns County | 2030 Stearns County Comprehensive Plan | 2008 | Land Use Plan<br>Natural Resources & Environmental Management Plan |
| Ashley Township | None adopted | NA | NA* |
| Getty Township | None adopted | NA | NA* |
| Raymond Township | None adopted | NA | NA* |
| Sauk Centre Township | None adopted | NA | NA* |

** While these townships have not adopted their own comprehensive plans all are included in the 2030 Stearns County Comprehensive Plan.*

Section 6.60 of the Stearns County Zoning Code of Ordinances governs Wind Energy Conversion Systems (WECS) at the local level. This Section states its purpose is, "to set forth a process for permitting wind energy conversion systems (WECS) and meteorological towers (MT) not otherwise subject to siting and oversight by the State of Minnesota under the Minnesota Power Plant Siting Act, Minnesota Statutes, section 216F.01-216F.081; or successor statutes." The Stearns County Board of Commissioners has created a sub-committee which serves as a recommending body on WECS. The applicant has been actively involved in the Stearns County WECS Sub-Committee, as the County has re-examined its WECS ordinance. The proposed Project intends to meet the siting provisions established within the Stearns County Zoning Code of Ordinances where feasible and reasonable. However, because the Project will be permitted through the State of Minnesota as a Large Wind Energy Conversion System, the applicant will adhere to State siting standards.

The Stearns County WECS Ordinance setback standards are as follows:

- 1.1 times the total turbine height from property lines
- 250 ft from public or private right-of-way or 1.1 times the total turbine height (whichever is greater)
- 750 ft from occupied structures, including, but not limited to, residential dwelling units, schools, churches, and places of business.
- 5 RD in all wind directions from the project boundary (although the Stearns County ordinance states (however, the Stearns County WECS ordinance states, "the Board may authorize a setback of less than 5 times the rotor diameter if the applicant demonstrates that due to the wind direction, the wake interference is less than 5 rotor diameters").

In determining the existing and future land use and zoning classifications for the proposed Project, the Applicant reviewed the official zoning maps of Ashley and Raymond townships, and found them to be consistent with the official zoning map of Stearns County. According to these maps, the proposed Project Area is not located within or adjacent to an urban expansion zone. The existing zoning maps for Raymond and Ashley townships are available on the Internet through the Stearns County Website[1]. Copies of the Ashley and Raymond township zoning maps are attached in Appendix A. This information can also be made available by contacting the Stearns County Environmental Services Department at (320) 656-3613 or toll free at 1-(800) 450-0852. Access to future zoning maps can be found within the 2030 Stearns County Comprehensive Plan updated March 2008.

### 8.2.2 CONSERVATION EASEMENTS

The U.S. Fish and Wildlife Service (USFWS) administers a program by which it holds easements on private lands that have wetlands and/or grassland habitat. Development may be restricted on lands held in a USFWS easement. No easements are known to exist within the Project Area; the USFWS has been contacted to verify the presence or lack of easements. Black Oak Wind is conducting a title search to identify conservation easements on any properties within the Project boundary. To date, none have been found. The Minnesota Department of Natural Resources (DNR) and Minnesota Board of Water and Soil Resources (BWSR) also administer conservation programs such as Reinvest in Minnesota (RIM), in which the DNR and/or BWSR holds easements on private lands for conservation purposes. RIM lands within the Project vicinity are shown on Figure 8-8 through Figure 8-10. The Nature Conservancy (TNC) is a non-profit, private organization that acquires lands for conservation purposes; there are no known TNC lands within or adjacent to the Project boundary (Figure 8-8 through Figure 8-10). No Project activities will occur within conservation easements held by public agencies or private organizations.

## 8.3 NOISE

Noise is defined as unwanted sound. It may be made up of a variety of sounds of different intensities, across the entire frequency spectrum. Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted scale (dBA) is used to reflect the selective sensitivity of human hearing. This scale puts more weight on the range of frequencies that the average human ear perceives, and less weight on those that we do not hear as well, such as very high and very low frequencies. The C-weighted scale (dBC) is used to reflect human sensitivity at louder levels. This scale puts more weight on the lower frequencies than does the A-weighted scale.

### 8.3.1 DESCRIPTION OF RESOURCES

The term *ambient acoustic environment* refers to the all-encompassing sound in a given environment or community. The outdoor ambient acoustic environment is a composite of sound from varying sources, distances, and directions. Common sound sources within an agricultural and/or rural environment include, but are not limited to, sound from farm equipment such as tractors and combines, sound generated from

[1] Stearns County Zoning Maps:
http://www.co.stearns.mn.us/Environment/LandUseandAgriculture/PermitInformationMap

traffic on roadways, sounds from birds, and wind rustling through the vegetation. Typically, the ambient acoustic environment of a rural or agriculturally-oriented community has *equivalent continuous sound levels* ($L_{eq,}$ which is an energy-based time-averaged noise level)) ranging from 30 dBA to 60 dBA. This range is based on HDR's extensive and qualified experience in reviewing noise levels in rural settings with high wind resources.

In agricultural and/or rural communities, the higher sound levels typically exist near roadways and near areas that experience greater human activities such as farming. In addition, compared with similar environments with lower quality wind resources, those environments with higher wind resources generally experience higher sound levels. Different communities can experience a wide variety of sound levels within their given ambient acoustic environments, and this variation of sound creates their respective spectral content.

### 8.3.2 IMPACTS

When in motion, wind turbines emit a perceptible sound. The level of this sound varies with the speed of the turbine and the distance of the listener from the turbine. Sound is generated from the wind turbine at points near the hub or nacelle, 80 to 100 m (262 to 328 ft) in the air, and from the blade tips as they rotate. The Applicant's sound analysis accounts for all noise-generating elements associated with wind turbines.

The Applicant proposes siting turbines at least 1,000 ft from residences, unless other arrangements have been made with specific residents. In the event that other arrangements are made with respect to turbine setbacks, all turbines will be setback 750 ft (per Stearns County Ordinance), plus the distance required to comply with the MPCA limit of a 50 dBA nighttime L50 noise level (L50 is the noise level exceeded 50 percent of the time). Further, the Applicant will attempt to site turbines to meet an additional 5 dB buffer for low frequency noise, as recommended by the Minnesota Department of Health's (MDH) white paper. A model was developed, using a software program called Cadna-A, to determine the noise level of a single turbine at a distance of 1,000 feet. All three proposed turbine types in the conceptual layouts will comply with the 50 dBA L50 at a distance of 1,000 feet. Predicted noise levels from a single turbine at 1,000 feet for the GE 1.6xle, the Vestas V90 and the Vestas V112 turbines are 43, 41, and 44 dBA respectively.

Project-related noise levels, resulting from all proposed wind turbines, were calculated at residences using Cadna-A. A technical report detailing the analysis is provided in Appendix B. This acoustical analysis software, designed for evaluating environmental noise from stationary and mobile sources, was used to calculate the $L_{eq}$ for all three turbine models. By assuming that wind speeds are constant for an entire one-hour period, the $L_{eq}$ calculated by Cadna-A can be compared to the Minnesota Pollution Control Agency's (MPCA) L50 standard. The MDH white paper indicates a 5 dBA buffer provides an adequate surrogate for low-frequency noise. The nighttime L50 standard is the most stringent noise limit in the MPCA standards; therefore, when combined with the 5 dBA buffer suggested by the MDH white paper, analysis results are appropriate and conservative for evaluating the acceptability of calculated wind turbine noise levels.

The baseline noise isopleths (a line or curve of equal values) are depicted in Figure 8-4 through Figure 8-6. All proposed wind turbines (noise sources) were modeled in Cadna-A and project-related noise levels

were calculated at 104 noise-sensitive receptors within the Project Area. Table 8-2 presents analysis results.

**Table 8-2. Summary of Noise Analysis**

| Turbine Make and Model | Maximum Project Related Leq, dBA | Average Project-Related Leq, dBA |
|---|---|---|
| GE 1.6xle | 45 | 30 |
| Vestas V90 | 44 | 28 |
| Vestas V112 | 45 | 28 |

The maximum calculated noise level, based on assumptions incorporated into the Cadna-A model and the most current turbine layout, results in a 45 dBA Leq at the nearest noise-sensitive receptor. Average project-related noise levels at residences for all turbine models range from 28 – 30 dBA, on an hourly Leq basis.

As depicted in the multi-turbine constraint maps all proposed turbine layouts comply with MPCA noise guidelines. Maximum calculated noise levels for all turbine models are at least 5dB below the nighttime L50 noise limit of 50 dBA.

### 8.3.3 MITIGATIVE MEASURES

Impacts to nearby residents and other potentially affected parties in terms of noise will be taken into consideration as part of the turbine siting. The Applicant proposes siting turbines at least 1,000 ft from residences, unless other arrangements have been made with specific residents. In the event that other arrangements are made with respect to turbine setbacks, all turbines will be setback 750 ft (per Stearns County Ordinance), plus the distance required to comply with the MPCA limit of a 50 dBA nighttime L50 noise level. To the extent that the sound characteristics of the selected turbine vary, the Applicant will ensure compliance with MPCA noise standards. Per the guidance from the MDH white paper, the preliminary layout has been modeled to help ensure cumulative impacts from all wind turbines, and maximum calculated noise levels for all turbine models, are at least 5 dB below the MPCA's nighttime L50 noise limit of 50 dBA, which the MDH suggested as a surrogate for low-frequency noise.

## 8.4 VISUAL IMPACTS

### 8.4.1 EXISTING AESTHETICS

The topography of the Project Area is glaciated, gently rolling plains with elevations ranging from 1,299 to 1,380 ft (395 to 420 m) above sea level (Stearns County 2008). Agricultural fields, farmsteads, and gently rolling topography visually dominate the Project Area. The landscape can be classified as rural open space. The photos in Figure 8-7 show typical landscapes within the Project Area.

Within the Project Area local vegetation is predominantly agricultural crops and pasture. Crops include corn, soybeans, small grains, and forage crops, which visually create a low uniform cover. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads. Generally, these forested areas are isolated groves or windrows established by the landowner/farmers to prevent wind

erosion and shelter dwellings. In the swales, there are occasional patches of native willows, cattails, sedges, and rushes.

The settlements in this area of Stearns County are residences and farm buildings (inhabited and uninhabited) scattered along rural county roads. These structures are focal points in the dominant open space character of the vicinity.

### 8.4.2 VISUAL IMPACTS ON PUBLIC RESOURCES

All potential turbine models will be relatively similar in appearance, with a monopole tower, a single hub, and three blades. The primary difference between layouts will be the RD and the number of turbines. In general, larger RD turbines will have larger output and thus the Project will require fewer turbines. The three representative models will have the following RD and number of turbines:

**Table 8-3. Rotor Diameter and Number of Turbines**

| Turbine Model | Rotor Diameter | Number of Turbines |
|---|---|---|
| GE 1.6xle | 82.5 m (271 ft) | 26 |
| Vestas V90 | 90.0 m (295 ft) | 23 |
| Vestas V112 | 112.0 m (367 ft) | 14 |

Though the 3.0 MW turbine (with a 94 m tower) is about 20 percent taller than the 1.6 MW turbine (with an 80 m tower), using a 3.0 MW turbine will require about 40 percent fewer turbines, so the larger turbine would be expected to have a smaller overall visual impact on the surrounding area.

Some of the Project's turbines will be located within the viewshed of Minnesota Department of Natural Resources (DNR)-managed Wildlife Management Areas (WMAs), U.S. Fish and Wildlife Service (USFWS) Waterfowl Production Areas (WPAs) or other natural areas and may be visible by people using those areas. Figure 8-8 through Figure 8-10 identify recreation and wildlife areas within the Project's vicinity.

There are five WMAs, seventeen WPAs and one Scientific and Natural Area (SNA) within 5 miles of the Project Area. A section of the Stearns County Snowmobile Trail runs adjacent to the southwestern corner of the Project Area. Further information regarding recreational lands in relation to the Project Area is found in Section 8.7.

While wind turbines will impact the visual surroundings of the Project Area, the degree of visual impact will vary based upon personal preferences.

### 8.4.3 VISUAL IMPACTS ON PRIVATE LANDS AND HOMES

The placement of turbines in the landscape will have an effect on the existing visual experience of the site and in nearby areas. Discussion of the aesthetics of the proposed wind farm is based on subjective human responses. For some viewers, the Project could be perceived as a visual intrusion; for other viewers, the Project may have its own positive aesthetic qualities. Operation of the wind farm will generate minimal vehicle traffic and will not significantly increase day-to-day human activity in the area. Therefore, the

Project Area will retain a rural sense and remote character. Also, although "industrial" in form and purpose, turbines are essentially "farming" the wind for energy. Though turbines are high-tech in appearance, they are compatible with the rural and agricultural heritage of the area.

The installation of the Project will alter the landscape and visual experience of the site. The topography in the vicinity is generally flat and the vegetation is uniformly low, making the high topography vulnerable to visual disruptions. Visual impacts will be most evident to people traveling north and south along County Highway 18, and east and west along 370th Street. There are no state highways within the Project Area. U.S. Highway 71 runs north and south and it is located approximately three miles east of the Project boundary. State Route 28 runs east and west, and it is located approximately one mile north of the Project boundary.

The Federal Aviation Administration (FAA) requires obstruction lighting or marking of structures more than 200 feet above ground to provide safe air navigation (FAA 2005). Black Oak Wind will apply to the FAA for approval of a lighting plan that is compliant with FAA requirements. It is anticipated that approximately 50 percent of the turbines will be lit. FAA requires synchronized flashing of red lights for wind turbines.

### 8.4.4 SHADOW FLICKER

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity at a given stationary location, or *receptor*, such as the window of a home. In order for shadow flicker to occur, three conditions must be met: first, the sun must be shining with no clouds to obscure it; second, the rotor blades must be spinning and must be located between the receptor and the sun; and third, the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it.

Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors:

- Sun angle and sun path – As the sun moves across the sky on a given day, shadows are longest during periods nearest sunrise and sunset, and shortest nearest midday. They are longer in winter than in summer. On the longest day of the year (the summer solstice), the sun's path tracks much farther to the north and much higher in the sky than on the shortest day of the year (the winter solstice). As a result, the duration of shadow flicker at a given receptor will change significantly from one season to the next.
- Turbine and receptor locations – The frequency of shadow flicker at a given receptor tends to decrease with greater distance between turbine and receptor. The frequency of occurrence is also affected by the sightline direction between turbine and receptor. A turbine placed due east of a given receptor will cause shadow flicker at the receptor at some point during the year while a turbine placed due north of the same receptor at the same distance will not, due to the path of the sun.
- Cloud cover and degree of visibility – As noted above, shadow flicker will not occur when the sun is obscured by clouds. A clear day has more opportunity for shadow flicker than a cloudy

day. Likewise, smoke, fog, haze, or other phenomena limiting visibility would reduce the intensity of the shadow flicker.

- Wind Direction – The size of the area affected by shadow flicker caused by a single wind turbine is based on the direction that the turbine is facing in relation to the sun and location of the receptor. The turbine is designed to rotate to face into the wind, and as a result, turbine direction is determined by wind direction. Shadow flicker will affect a larger area if the wind is blowing from a direction such that the turbine rotor is near perpendicular to the sun-receptor view line. Similarly, shadow flicker will affect a smaller area if the wind is blowing from a direction such that the turbine rotor is near parallel to the sun-receptor view line.
- Wind Speed – Shadow flicker can only occur if the turbine is in operation. Turbines are designed to operate within a specific range of wind speeds. If the wind speed is too low (cut-in speed) or too high (cut-out speed), the turbine will not operate, eliminating shadow flicker.
- Obstacles – Obstacles, such as trees or buildings, which lie between the wind turbine and the receptor have a screening effect and can reduce or eliminate the occurrence of shadow flicker.
- Contrast – Because shadow flicker is defined as a change in light intensity, the effects of shadow flicker can be reduced by increasing the amount of light within a home or room experiencing shadow flicker.
- Local topography – Changes in elevation between the turbine location and the receptor can either reduce or increase frequency of occurrence of shadow flicker, compared to flat terrain.
- Maintenance – Turbines which are inoperable for maintenance reasons will obviously cause no occurrence of shadow flicker.

A typical shadow flicker distribution map is included in Figure 8-11. The shadow flicker frequency in the figure was created using the WindPro Modeling program (Version 2.7) using the typical assumptions for distribution of wind direction and sunshine probability (Table 8-4 and Table 8-5). The assumptions are specific to the Project area.

**Table 8-4. Wind Direction Distribution Assumptions for Shadow Flicker Model**

| Direction | N | NNE | ENE | E | ESE | SSE | S | SSW | WSW | W | WNW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percent Blowing in Direction | 9.32 | 5.13 | 4.75 | 5.69 | 9.96 | 10.75 | 10.91 | 5.88 | 4.78 | 8.93 | 11.56 | 12.34 |

**Table 8-5. Probability of Sunshine Assumptions for Shadow Flicker Model**

| Month | Jan | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sunshine Probability | 36% | 45% | 53% | 52% | 59% | 63% | 65% | 59% | 51% | 42% | 28% | 28% |

*Data gathered from WindPro*

By simulating the sun path throughout a whole year, the software calculates the number of hours per year as well as maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines. Shadow flicker can be modeled using either "expected" case or "worst case" scenarios. Worst case scenarios are based on simulated conditions where:

- There is always sunshine,
- The turbine is always in operation,
- The wind direction always orients the rotor perpendicular to the sun-receptor sightline,
- Specific window configurations on houses are not considered, and
- There are no local obstacles blocking potential shadows such as buildings or vegetation.

A worst case scenario can be refined to represent a less conservative expected scenario by incorporating one or more realistic features in the model:

- Wind Direction – Turbine rotors do not orient themselves to the sun all day, every day, as modeled in the worst case scenario. To adjust for actual rotor direction, wind data is entered into the model. For the analysis included in this application, wind data was taken from the temporary meteorological tower located in the Project Boundary.
- Turbine Operating Hours – The turbine will not be operational all of the time due to local winds being outside of turbine operation specifications, or due to maintenance. Project specific wind rose data again was incorporated to reflect the frequency of sufficient wind speed to activate the turbine. The expected percentage of time the turbine is activated is multiplied by the number of minutes of shadow flicker.
- Actual Sunshine Hours – Sunshine hours are affected by cloud cover, fog or haze, time of day, and time of year. This data is provided by the WindPro software which selects the nearest weather station from its database.

Combining one or more of these three mitigating factors creates a less conservative scenario which aims to produce a scenario closet to the actual expected results. These “expected” results represent a significant reduction in shadow flicker hours per day or per year in contrast to a worst case scenario. However, if all of the above factors are incorporated into the model, it is possible – though not likely- to have lower modeled results compared to actual results in the field. This is due to the fact that true meteorological factors like wind direction or sunshine hours could be different form the averages used in a way that is worse for shadow flicker.

### 8.4.5 IMPACTS

At a distance of 1,000 feet or greater (the Project minimum setback for residences), receptors will typically experience shadow flicker only when the sun is low in the sky, and only when the factors described in Section 8.4.4 dictate. If a residence does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (less than 1 percent) of annual daylight hours.

Table 8-6 shows the hours/year of shadow flicker for the worst case and expected case scenarios for each turbine model type. The expected case results incorporate all three of the realistic features described above (wind direction, turbine operating hours, and actual sunshine hours).

**Table 8-6. Shadow Flicker Hours per Year**

| Receptor Data (Direction) | Turbine Model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GE 1.6xle (HH: 80m. RD: 82.5m) | | GE 1.6xle (HH: 100m, RD: 82.5m) | | Vestas V90 (HH: 80m, RD: 90m) | | Vestas V90 (HH: 95m, RD: 90m) | | Vestas V112 (HH: 84m, RD: 112m) | | Vestas V112 (HH: 94m, RD: 112m) | |
| | Worst | Expected | Worst | Expected | Worst | Expected | Worst | Expected | Worst | Expected | Worst | Expected |
| A (NNW) | 80:51 | 26:30 | 98:42 | 32:27 | 92:25 | 30:18 | 108:17 | 35:34 | 135:10 | 44:23 | 146:30 | 48:19 |
| B (N) | 12:29 | 3:20 | 54:19 | 15:26 | 22:42 | 6:14 | 55:29 | 15:45 | 64:50 | 18:23 | 86:51 | 24:51 |
| C (NNE) | 77:28 | 20:01 | 97:36 | 25:19 | 89:14 | 23:05 | 106:12 | 27:32 | 131:47 | 34:08 | 143:57 | 37:26 |
| D (ENE) | 66:36 | 20:16 | 60:16 | 19:34 | 79:43 | 24:17 | 73:35 | 23:33 | 122:28 | 37:53 | 115:41 | 36:48 |
| E (E) | 70:20 | 31:10 | 72:57 | 33:00 | 84:06 | 37:22 | 86:34 | 39:01 | 133:44 | 60:05 | 137:49 | 62:28 |
| F (ESE) | 0:00 | 0:00 | 0:00 | 0:00 | 10:44 | 5:40 | 0:00 | 0:00 | 38:12 | 20:21 | 15:06 | 7:59 |
| G (SSE) | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 |
| H (S) | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 |
| I (SSW) | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 | 0:00 |
| J (WSW) | 2:10 | 0:53 | 0:00 | 0:00 | 13:21 | 5:35 | 0:00 | 0:00 | 41:04 | 17:17 | 17:58 | 7:31 |
| K (W) | 70:05 | 31:01 | 72:33 | 32:47 | 83:47 | 37:11 | 86:05 | 38:45 | 133:12 | 59:47 | 136:57 | 62:00 |
| L (WNW) | 66:24 | 25:36 | 59:56 | 24:40 | 79:14 | 30:36 | 73:19 | 29:44 | 121:54 | 47:47 | 115:07 | 46:24 |

*Source; WindPro Results*

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it generally is no greater than approximately 1.5 hertz (i.e., 1.5 flashes per second). The Epilepsy Foundation has determined that generally, the frequency of flashing lights most likely to trigger seizures is between 5 and 30 flashes per second.

### 8.4.6 MITIGATIVE MEASURES

To mitigate visual impacts of turbines, Black Oak Wind will adhere to the following measures:

- Turbines will be uniform in color
- Turbines will not be located in biologically sensitive areas such as parks, WMAs, WPAs, SNAs or wetlands
- Turbines will have lighting only to meet the minimum requirements of FAA regulations
- Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed
- Access roads created for the wind farm facility will be located on gentle grades to minimize erosion, visible cuts, and fills.

In addition to these measures, Black Oak Wind will consider shadow flicker when siting wind turbines. A shadow flicker analysis will be provided at the preconstruction meeting, and an opportunity to review the shadow flicker investigation will be provided to anyone anticipated to experience more than 1% of annual daylight flicker. Beyond these conservative measures of siting to prevent shadow flicker, such as 1,000-foot setbacks from residences, other mitigation measures will be considered and implemented on a case-by-case basis. Flicker will be addressed as situations arise wherein a residence is experiencing inordinately more flicker than anticipated in the modeling, although it is highly unlikely more flicker than modeled will occur. Flicker occurrences should be documented daily for several consecutive months including time of day and duration. Documentation must include the location of where the shadow flicker is occurring at and thus disturbing the residence (such as a window or front porch), as well as the location of the turbine causing the flicker. Mitigation measures will be determined by the individual circumstances of residences experiencing shadow flicker, and as a reasonable function of the amount of flicker experienced. Such mitigation measures may include

- Providing exterior screening such as vegetation, as a buffer from flicker where appropriate and reasonable.
- Providing indoor screening, such as curtains or blinds in windows, where appropriate and reasonable.
- Providing exterior screening such as awnings over windows, where appropriate and reasonable.
- Providing education about how to minimize the effect of shadow flicker, such as:
    - Lighting the room with the window(s) upon which shadow is cast.
    - Leaving the room with the window(s) upon which shadow is cast and instead occupying another room for a brief period of time.
    - Understanding how and why shadow flicker occurs.
    - Providing information on the Applicant's website about shadow flicker.

## 8.5 PUBLIC SERVICES AND INFRASTRUCTURE

The Project is located in a moderately populated, rural area in central Minnesota (Figure 1-1). There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the Project Area. The unincorporated town of Padua is located immediately southwest of the Project. The closest towns to the Project Area are Sauk Centre, Westport, and Elrosa. Each town is located approximately 5 miles from the Project Area. These communities provide sanitary sewer and water services within the city limits. Sauk Centre also provides cable television, telephone, and library services. Additionally, the city's emergency services include a full-time fire department and a police department. The townships and the cities of Elrosa and Westport have limited public infrastructure services. Sauk Centre provides police and fire services to parts of the Project Area. Homes and farms in the Project Area typically use private wells and septic systems for their household needs. According to the MN Department of Health's County Well Index online database, there are approximately 18 wells within the Sections containing the Project Area (MN Dept of Health, 2009b).

**Impacts**

The Project is expected to have a minimal effect on existing public services and infrastructure. The following section describes specific impacts that may occur during the Project construction and operation.

**Mitigative Measures**

Construction and operation of the proposed wind Project will be in accordance with all associated federal and state permits and laws, as well as industry construction and operation standards. Because minor impacts are expected on the existing infrastructure during the Project construction and operation, extensive mitigation measures are not anticipated.

### 8.5.1 ROADS

In general, the existing roadway infrastructure in and around the Project Area is characterized by county and township roads that generally follow section lines. Various county and township roads provide access to the proposed site. Access to the Project Area also includes two-lane paved and gravel roads. In the agricultural areas, many landowners use private, single-lane farm roads and driveways on their property. Roads within the Project boundary are summarized in Table 8-7.

**Table 8-7. Summary of Roadways within Project Boundary**

| Road Type | Miles within Project Boundary |
|---|---|
| Federal Highways | 0 |
| State Highways | 0 |
| County Highways/Road | 8.9 |
| Township Roads | 5.8 |
| Private Roads | 0 |

The existing traffic volumes on the area's county highways are documented on Table 8-8. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Annual Average Daily Traffic (AADT). The highest existing AADT in or near the Project area is 2,412 vehicles per day along State Highway 28, using 2005 data and according to the Stearns County Comprehensive Plan. Along the county highways, the AADTs are generally below 225 vehicles per day.

**Table 8-8. Existing Daily Traffic Levels**

| Roadway Segment Description | Existing Annual (AADT) |
|---|---|
| CSAH 18 between CSAH 28 and 390th Street | 225 |
| CSAH 26 between CSAH 28 and 370th Street | 165 |
| County Road 28 CSAH 18 and Queensfield Road/425th Avenue | 125 |

*Source: 2009 Traffic Volume General Highway Map, Stearns County, MN*

**Impacts**

During the construction phase, temporary impacts are anticipated on some public roads within the Project area. Roads will be affected by the transportation of equipment to and from the Project site, as well as potentially expanding roads along specific routes as necessary to facilitate the movement of equipment. Construction traffic will use the existing county and state roadway system to access the Project Area and deliver construction materials and personnel. Construction is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project Area.

The maximum construction workforce is expected to generate approximately 250 additional vehicle trips per day. The functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Currently, the heaviest traffic is on County Highway 22 south of the Project at 390 AADT. Most of the county roads in and near the Project area have AADTs between 75 and 390.

**Mitigative Measures**

Black Oak Wind will develop a transportation plan and road restoration agreement in cooperation with the applicable County and/or township road authority. Impacted roadways will be restored per the road restoration agreement. Black Oak Wind will ensure that the general contractor communicates with the respective road authority throughout the construction process, particularly as it pertains to the movement of equipment on roads and those items identified within the road and transportation agreement.

Since many of the area roadways have AADTs that are currently well below capacity, the addition of 250 vehicle trips would be perceptible, but similar to seasonal variations such as autumn harvest.

Truck access to the Project area is generally served by US 71 or TH 28. Specific additional truck routes will be dictated by the location required for delivery. Additional operating permits will be obtained for over-sized truck movements.

The operations phase of the proposed Project will require a small maintenance crew driving through the area to monitor and maintain the wind turbines as needed. There would be a slight increase in traffic for occasional turbine and substation repair, but no impacts to traffic function would result from this. Turbines will be setback from all public roads a minimum of 250 feet from the edge of the road right of way.

### 8.5.2 TELECOMMUNICATIONS

Telephone service in the area is provided by Lakedale Telephone Company, Mediacom, and other local telephone companies. Construction and operation of the proposed wind farm will not impact telephone service to the Project Area. Gopher One Call will be contacted prior to construction to locate and enable avoidance of all underground facilities. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, the Applicant will enter into agreements with service providers to avoid interference with their facilities.

### 8.5.3 COMMUNICATIONS SYSTEMS

The Applicant has conducted a microwave beam path analysis, which identified one path crossing the southern part of the Project Area (Figure 8-1 through Figure 8-3). Other communication signals licensed by the Federal Communications Commission (FCC) within five miles of the Project boundary are listed in

Table 8-9. The Applicant will not operate the wind farm so as to cause microwave, radio, telephone, or navigation interference contrary to FCC regulations or other law. In the event the wind farm or its operation causes such interference, the Applicant will take the steps necessary to correct the problem.

**Table 8-9. FCC Licensed Signals within Five Miles of Project Boundary**

| Communication System Type | Number of Signals |
|---|---|
| ASR | 4 |
| FM | 1 |
| Microwave | 6 |
| Cellular | 1 |
| LM broadcast | 1 |
| **Total** | **13** |

*Source: FCC GIS Data*
*ASR =Antenna Registration System*
*FM = FM Radio Signal*
*Microwave = Radio wave transmission*
*LM Broadcast = Land mobile broadcast tower*

### 8.5.4 TELEVISION

The Applicant will conduct an off-air television reception analysis of the Project. Digital signals within the Project area are listed in Table 8-10. The Applicant will not operate the wind farm such that it causes television interference contrary to FCC regulations or other law. In the event of a problem after construction, the Applicant will work with affected residents to determine the cause of interference and, where necessary, reestablish acceptable reception in a timely fashion.

**Table 8-10. Digital Television Signals In Project Area**

| Call Sign | Network | City of License | Signal Strength |
|---|---|---|---|
| KCCO | CBS | Alexandria, MN | Strong |
| KSAX | ABC | Alexandria, MN | Strong |
| KPXM | ION | St Cloud, MN | No Signal |
| KWCM | PBS | Appleton, MN | No Signal |
| KAWB | PBS | Brainerd, MN | No Signal |

*Source: FCC website*

### 8.5.5 OTHER INFRASTRUCTURE

No railroads or underground pipelines are located within the Project boundary; the Project will not affect any railroads or pipelines. There is currently one major utility corridor in the Project Area. Great River Energy (GRE) owns a 500 kV DC transmission line which runs through the Project Area. Xcel Energy owns a 69 kV transmission line approximately 4 miles west of the Project Area and GRE owns a 69 kV transmission line approximately 3 miles southwest of the Project Area. Distribution lines are present, but infrequent in the Project Area.

Construction and operation of the proposed wind farm Project will not significantly impact the water supply. A water supply may be necessary for the operations and maintenance facility depending on its location, which is anticipated to require a new private well. Water usage during the operating period will be similar to household volume; less than five gallons per minute. Water use during construction will occur at a higher rate to provide dust control and water for concrete mixes. In the event wells are abandoned, they will be capped as required by Minnesota law. The Project will not require the appropriation of surface water or permanent dewatering. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches.

## 8.6 CULTURAL AND ARCHAEOLOGICAL RESOURCES

### 8.6.1 DESCRIPTION OF RESOURCES

The State Historic Preservation Officer (SHPO), OES, and Office of the State Archaeologist (OSA) were contacted in June 2010 to initiate project coordination and HDR has conducted a literature search based on the Project Area as of May 14, 2010 (Appendix C). The proposed wind farm Project is located within the Central Lakes Deciduous South archaeological sub-regions, which include all of Anoka, Benton, Chisago, Hennepin, Isanti, Mille Lacs, Morrison, Ramsey, Sherburne, Stearns, Todd, Wadena, Washington, and Wright counties (Anfinson 1990). It also contains portions of Becker, Cass, Crow Wing, Dakota, Douglas, Kandiyohi, Kanabec, Meeker, Otter Tail, Pine, Pope, and Swift Counties and extends into west central Wisconsin. Archaeological resource sites are numerous in this region according to an overview entitled "Model: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota Final Report ", specific section entitled "Minnesota's Environment and Native American Culture History" by Gibbon, Johnson, and Hobbs (2002).

HDR collected data from SHPO in St. Paul, Minnesota, on known cultural resources information, derived from previous professional cultural resources surveys and reported site leads. Data collection included gathering records of sites and reports within the Project Area and a 1-mile search area outside the Project boundary. The standard 1-mile search area is used to gather valuable information regarding the location of previously identified cultural resources and cultural resources surveys. This information is then used to identify site types that may be encountered and landforms or areas that have a higher potential for containing significant cultural resources. Collected data includes archaeological site files and previous cultural resources studies and reports.

Due to the project boundary expanding to the north in November 2010, the additional 1 mile boundary surrounding the Project Area has not been reviewed at this time. Prior to construction, six additional sections (Township 126 Range 35 Sections 22-24, 28 and Township 126 Range 34 Sections 19 and 30) will be reviewed for resources at the SHPO.

The 19th-century Public Land Survey (PLS) maps were reviewed to identify potential historic-period facility features that may exist in the Project Area. Based on this information a Phase Ia Inventory (Appendix C) was prepared which reports on the results of the literature review described above and recommends a course of action for further analysis, such as a Phase I archaeological field survey of the site. The Phase Ia Inventory documented one previous cultural resources report and three historic facility resources within or near the Project Area.

No archaeological resources have been documented within the data gathering area. However, it is likely that additional undiscovered archaeological sites exist within the Project boundary.

Three historic facility resources were identified within the data gathering area. They are a rural school, the Church of St. Anthony; and, the Padua town maintenance shed (Appendix C - Figure 1).

The PLS maps for the Project Area illustrates environmental conditions, including watercourses and elevation variations across the landscape, during the mid 1880s. The maps indicated one historic-period land use within the Project Area. This historic facility is represented by a road running from Pembina to St. Cloud and the Mississippi (also known as a *Red River Road*). The road runs through Township 125N, Range 35W, Sections 2-4, 11-13. Due to the expansion of the project boundary, the PLS map sections that correspond to the extended boundary will also need updating.

The presence of this resource in the data gathering area shows that European American settlement had reached this vicinity by around 1860.

### 8.6.2 IMPACTS

Archaeological resources could be impacted directly during the construction of a wind energy facility. Construction within the turbine footprint, cable trenching, access roads, and borrow areas could impact archaeological resources. In addition, construction of turbines or other protruding structures may impact viewshed integrity from existing historic facilities.

A letter was sent to the Minnesota SHPO, OSA, and OES in June of 2010. HDR received a response from SHPO on July 13, 2010 (Appendix C). SHPO recommended that an archaeological resources survey be completed prior to project construction.

### 8.6.3 MITIGATIVE MEASURES

Even though there is no recorded archaeological site information or information from previous survey reports, it is likely that the Project Area has potential to contain archaeological resources. These archaeological resources would most likely be located on or near elevated landforms and areas near permanent water sources. In addition, the recorded historic facilities in the data gathering area imply that additional resources of these types and ages may be present within the Project Area. Black Oak Wind will conduct a Phase I archaeological resources inventory and work cooperatively with SHPO, OSA, and OES. The archaeological resource inventory will focus on areas proposed for project construction, including wind turbine locations, associated access roads, electrical cable routes, and other construction elements. These investigations will be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as published in Title 36 Code of Federal Regulations Part 6. Survey strategies (pedestrian and/or shovel probing and/or deep testing) for the archaeological resource inventory will depend on surface exposure and the characteristics of the landforms proposed for development. After receiving the proposed turbine, access road, and electrical cable layouts, archaeologists will design an appropriate survey strategy for archaeological resources. This proposed survey strategy will be shared with SHPO, OSA, and OES to gather their input on the methodology. Higher potential areas for archaeological resources will most likely include portions of the Project Area near a permanent water source, and areas of higher elevation.

If archaeological resources are identified during the survey, an archaeologist will identify the location and record Universal Transverse Mercator (UTM) coordinates so that Project construction layout can consider the location and adjust construction plans if desired. If Project construction plans cannot be adjusted, further investigation of the resource may be needed and further coordination with SHPO, OSA, and OES will be required. This additional investigation would be described and documented on a case by case basis. The results of the investigation will be compiled and documented in a report or reports and shared with SHPO, OSA, and OES for their review.

## 8.7 RECREATION

### 8.7.1 DESCRIPTION OF RESOURCES

Recreational opportunities in Stearns County include hiking, biking, boating, fishing, camping, swimming, horseback riding, cross country skiing, snowmobiling, hunting, and nature viewing. Figure 8-8 to Figure 8-10 depict the locations of state and county parks, WMAs, SNAs and WPAs near the proposed Project Area.

Minnesota WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These DNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. There are no WMAs within the Project Area. WMAs located within ten miles of the Project boundary are included in Table 8-11.

**Table 8-11. Wildlife Management Areas less than Ten Miles from the Project Boundary**

| Distance from Project Boundary (mi) | WMA Name | General Location | WMA Area (acres) |
|---|---|---|---|
| 0.1 | Padua WMA | Southeast | 323.8 |
| 2.0 | Tower WMA | West | 80.8 |
| 3.0 | Victor Winter WMA | North | 160.3 |
| 3.2 | Miller WMA | North | 39.1 |
| 3.3 | Sauk River WMA | East | 901.2 |
| 5.0 | Spirit Marsh WMA | East | 38.8 |
| 6.2 | Milton Kjeldahl WMA | South | 194.2 |
| 6.4 | Kuhtz WMA | Northwest | 24.9 |
| 6.5 | Vision WMA | Southeast | 233.6 |
| 6.6 | Oxcart Crossing WMA | South | 212.1 |
| 7.3 | Herberger WMA | Northwest | 156.0 |
| 8.1 | Aurzada Prairie WMA | North | 104.9 |
| 8.1 | West Union WMA | North | 244.3 |
| 8.8 | Quistorff WMA | North | 360.9 |
| 9.1 | Spohn WMA | North | 161.8 |
| 9.1 | Gravel Pit 1676 WMA | Southeast | 15.5 |

| Distance from Project Boundary (mi) | WMA Name | General Location | WMA Area (acres) |
|---|---|---|---|
| 9.6 | Edward R Mohs WMA | South | 195.9 |
| 9.7 | Sedan WMA | Southwest | 451.9 |

SNAs are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values. SNAs located within ten miles of the Project boundary include:

- Sedan Brook Prairie SNA, located 4.8 miles south of the Project boundary

WPAs are managed to protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems. WPAs located within ten miles of the Project boundary are shown on Table 8-12.

**Table 8-12. Waterfowl Production Areas Less than Ten Miles from the Project Boundary**

| Distance from Project Boundary (mi) | WPA Name | General Location | WPA Area (Acres) |
|---|---|---|---|
| Adjacent | Behnen | West | 370.9 |
| Adjacent | Trisko | East | 401.8 |
| 0.7 | Wiener | Northwest | 100.1 |
| 1.1 | Padua | Southwest | 675.7 |
| 1.5 | Claude | West | 62.3 |
| 1.6 | Ashley | Northwest | 876.3 |
| 2.0 | Whitney | North | 345.9 |
| 2.5 | Dickhaus | West | 322.8 |
| 2.5 | Kenna | East | 250.4 |
| 2.5 | Pope | West | 159.3 |
| 3.0 | Krantz Lake | West | 1110.3 |
| 3.1 | Gettel | North | 115.9 |
| 3.5 | Zehrer | Northeast | 144.6 |
| 4.3 | Westport | West | 139.4 |
| 4.8 | Mccormick Lake | East | 245.1 |
| 4.9 | Schurman | East | 18.0 |
| 5.0 | Costello | Northeast | 106.3 |
| 5.4 | Stoney Creek | Southeast | 48.8 |
| 5.6 | Stearns | Southwest | 27.6 |
| 6.0 | Crosier | East | 99.4 |
| 6.5 | Baily | West | 44.8 |
| 6.7 | Bredberg | Northwest | 156.7 |

| Distance from Project Boundary (mi) | WPA Name | General Location | WPA Area (Acres) |
|---|---|---|---|
| 7.1 | Grove Lake | West | 593.0 |
| 7.2 | West Union | Northwest | 309.0 |
| 7.3 | Holder | Northwest | 45.0 |
| 7.3 | Twin Lakes | Northeast | 158.4 |
| 7.4 | Schultz Lake | Northwest | 319.8 |
| 8.2 | Terfehr | North | 70.6 |
| 8.9 | Lake George | Southeast | 76.2 |
| 9.0 | Sogge | North | 135.1 |
| 9.4 | Greenwald | East | 200.5 |
| 9.4 | Orange | Northwest | 240.0 |
| 9.8 | Bangor | Southwest | 385.1 |
| 10.0 | Spring Hill | Southeast | 9.6 |

No National Wildlife Refuges (NWR) were identified within 10 miles of the Project boundary. The Project is located within the Sauk River Watershed District. According to the Stearns County Comprehensive Plan, there are no planned or proposed trails or parks within the Project Area. One recreational trail, the Lake Wobegon Trail, is located approximately five miles northeast of the Project boundary. One snowmobile trail, which passes through the Padua WPA, the Claude WPA, and the Ashley WPA, is also located near the Project area.

### 8.7.2 IMPACTS

The Project will avoid all WMAs, SNAs, USFWS lands, and public parks. In general, recreational impacts will be visual in nature affecting individuals using public land near the Project Area for recreation. See Section 8.4 for additional discussion of visual impacts and proposed mitigative measures. Visual impacts will be most evident to visitors using any WMA, SNA, or snowmobile trail within a 1- to 4-mile radius of the site.

### 8.7.3 MITIGATIVE MEASURES

Project turbines and facilities will not be located within public parks, trails, WMAs, or in USFWS lands. Turbines will be set back from public lands based on a minimum of the 3 RD by 5 RD setbacks from all non-leased properties per the OES siting guidelines, and at least 250 feet from public trails.

## 8.8 PUBLIC HEALTH AND SAFETY

### 8.8.1 EMF

The term electromagnetic field (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is

related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMF can occur indoors and outdoors. However, there are no discernible health impacts from power lines (NIEH, 1999). Wind turbine generators and power lines will be setback from residences according to state and county standards, where EMF will be at background levels.

**Impacts**

While the general consensus is that electric fields pose no risk to humans, the question of whether or not exposure to magnetic fields potentially causes biological responses or even health effects continues to be the subject of research and debate. EMF from underground electrical collection lines dissipates very close to the lines because they are installed below ground within insulated shielding. The electrical fields are negligible, and there is a small magnetic field directly above the lines that, based on engineering analysis, dissipates within 20 feet on either side of the installed cable. EMF associated with the transformers at the base of each turbine completely dissipates within 500 ft, so the 1,000 ft turbine setback from residences will be adequate to avoid any EMF exposure to homes.

**Mitigative Measures**

No impacts due to electromagnetic fields are anticipated and no mitigation is necessary.

### 8.8.2 AIR TRAFFIC

There are four airports located in Stearns County within 20 miles of the Project Area (Table 8-13). The nearest airport is Sauk Centre Municipal Airport, located approximately 4 miles northeast of the Project Area.

**Table 8-13. Airports within 20 Miles of the Project Site**

| Airport Name | MN City | MN County | Distance[a] | Runway Information[b] | Runway Elevation (feet) [c] |
|---|---|---|---|---|---|
| Sauk Centre Municipal | Sauk Centre | Stearns | 4.0 | Turf, Asphalt | 1,244 |
| Brooten Municipal | Brooten | Stearns | 8.5 | Asphalt | 1,305 |
| Glenwood Municipal | Glenwood | Pope | 11.7 | Asphalt | 1,393 |
| Todd Field | Long Prairie | Todd | 15.6 | Asphalt | 1,333 |
| Douglas County Hospital | Alexandria | Douglas | 19.0 | Asphalt | 1,418 |
| Chandler Field | Alexandria | Douglas | 19.3 | Asphalt | 1,425 |

[a] *Distance in miles from the nearest portion of the Black Oak Wind Project boundary.*
[b] *Runway surface type and condition.*
[c] *Elevation in feet at the highest point on the centerline of the useable landing surface. Measured to the nearest foot with respect to mean sea level (MSL).*

Air traffic may be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine towers in active croplands and installation of aboveground collection lines, if needed, will create a potential for collisions with crop-dusting aircraft. However, aboveground collection lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways) and the turbines themselves would be visible from a distance and lighted according to FAA guidelines.

**Impacts**

The closest airport to the proposed wind farm is the Sauk Centre Municipal airport, located approximately 4 miles from the Project Area. Black Oak Wind will coordinate with the Sauk Centre airport, the FAA, and MnDOT prior to construction.

The Project will be reviewed by the FAA, and a "No Hazard" issuance determination is expected. The FAA review will be for turbines with total height of up to 499 feet. If taller turbines are used or if the project layout changes from what had been provided to the FAA, the Project will re-file with the FAA for the changes. The wind and meteorological towers will have lighting to comply with FAA requirements. The Applicant will notify local airports about the Project including locations of new towers in the area to minimize impacts and reduce potential risks to crop dusters. The applicant has prescreened the project area using the tools available on the FAA's Obstacle Evaluation website and found the area to have no identified impacts to aviation radar or military flight activities.

**Mitigative Measures**

The Applicant will mark and light the turbines to comply with FAA requirements. The Applicant will paint meteorological towers red at the top to improve visibility and will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Black Oak Wind will work with landowners on coordinating crop dusting activities. Permanent meteorological towers will be free-standing with no guy wires. Temporary meteorological towers will have supporting guy wires which will be marked with safety shields (colored balls) for increased visibility.

### 8.8.3 SAFETY AND SECURITY

**Description of Resources**

The proposed wind farm site is located in a rural setting that has a moderate population density. Construction and operation of the Project will have minimal impacts on the security and safety of the local populace.

**Impacts**

Project construction and operation will have no significant impact to security and safety of local residents. In some past wind farm projects, wind turbines have posed hazards to human safety from tower collapse and blade throw, typically as a result of seismic events. The Project Area is within a region considered to have low seismic activity (Gomberg 2007). Furthermore, modern turbine technology, in addition to proactive maintenance and inspections, has reduced these risks to insignificant rates.

**Mitigative Measures**

The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers will be setback from occupied homesteads according to state and county standards. These distances are considered to be safe based on developer experience, and are consistent with prior LWECS site permits.

- Security measures will be taken during the construction and operation of the Project including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities.
- Regular maintenance and inspections will address potential blade failures, minimizing the potential for blade throw.
- Turbines will sit on solid steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable. Access to the interior of the tower is only through a solid steel door that will be locked when not in use.
- Permanent meteorological towers will be free-standing. The guy wires on temporary meteorological towers will have color sleeves at ground level to increase visibility.
- Where necessary or requested by landowners, the Applicant will construct gates or fences.

## 8.9 HAZARDOUS MATERIALS

### 8.9.1 DESCRIPTION OF RESOURCES

The land within the Project Area is primarily rural and used for agriculture. Potential hazardous materials within the Project Area would be associated with agricultural activities, and include petroleum products (fuel and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-based paint, asbestos shingles, and polychlorinated biphenyls in transformers. Trash and farm equipment dumps are common in rural settings.

A Preliminary Environmental Review was conducted in the Project Area in August 2009, which identified two Environmental Concerns (ECs) within the Project Area. One EC is associated with aboveground storage tanks located on a farmstead within the project area (SE quarter of Section 12). The tanks likely contain petroleum products and represent a material threat of release. The second EC is a burn pit associated with a farmstead, which, depending on the items disposed of and burned in the pit, may present a risk of elevated levels of metals, polyaromatic hydrocarbons, or other contaminants in the groundwater. Both of these sites represent typical ECs in a rural, agricultural area and will not be impacted by project construction.

As part of the Project financing process, an ASTM E 1527-05 conforming environmental site assessment (ESA) will be conducted for the Project Area.

Three types of petroleum product fluids are necessary for the operation of each turbine and include:

- Gear box oil – synthetic or mineral depending on application (approximately 300 liters)
- Hydraulic fluid
- Gear grease

These wastes will be managed and, if disposal is necessary, disposed of in compliance with the requirements of applicable laws and regulations

### 8.9.2 IMPACTS

The Applicant will conduct an ESA prior to construction to locate and avoid hazardous waste sites.

Turbine hydraulic oils and lubricants will be contained within the wind turbine nacelle, or in the case of car, truck, and equipment fuel and lubricants, within the vehicle. Transformer oil will be contained within the transformer. Fluids will be monitored during maintenance at each turbine and transformer. A small amount of hydraulic oil, lube oil, grease, and cleaning solvent will be stored in the O&M building. When fluids are replaced, the waste products will be handled according to regulations and disposed of through an approved waste disposal firm.

### 8.9.3 MITIGATIVE MEASURES

Because any potential hazardous waste sites identified will be avoided, no mitigative measures are necessary. If any wastes, fluids, or pollutants are generated during any phase of the operation of the Project, they will be handled, processed, treated, stored, and disposed of in accordance with Minnesota Rules Chapter 7045.

## 8.10 LAND-BASED ECONOMIES

### 8.10.1 AGRICULTURE/FARMING

**Description of Resources**

The majority of the Project Area is farmland and grassland, as shown in Figure 8-12 through Figure 8-14. Cultivated land comprises approximately 5,917 acres (84 percent) of the Project Area. Grasslands comprise approximately 1,015 acres (14 percent) of the site. Essentially, the whole Project Area is used for agricultural purposes. Corn, soybeans, small grains, and forage crops are grown throughout Stearns County. Feeding cattle and hogs, raising livestock, and dairy farming are major sources of income. Within the Project Area, the trend is toward fewer and larger farms (Stearns County 2008). Converting cropland to the Conservation Reserve Program (CRP) and the RIM program is another source of farm income. CRP and RIM lands are cropland planted to conservation grasses and legumes to protect and improve the soil and cannot be harvested or pastured. CRP land is enrolled for 10-year periods, whereas RIM conservation easements are permanent.

The majority of cropland in Stearns County is planted with corn, soybeans, and alfalfa. Small grains, forage, and pasture are additional crops in the Project Area.

Large-scale animal production has been a growing component of the agricultural industry in recent years. Feedlots used for the confined feeding, breeding, or holding of animals are a common practice for animal production. There are 2,469 feedlots, either registered or required to be registered, in Stearns County (MPCA 2009).

Most of the soil within the Project Area is prime farmland. The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) identifies prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pasture land, forestland, or other land. Important

farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance (U.S. Department of Agriculture 2009b).

**Impacts**

Specific impacts to agricultural lands (approximately 13.5 to 20 acres) will be determined once turbine model, turbine and road placement, and substation/O&M facility locations have been finalized. Most of the soil within the Project Area is considered prime farmland. The loss of agricultural land to the construction of the wind farm will reduce the amount of land that can be cultivated. Less than one half of 1 percent of the Project Area will be converted to non-agricultural land use. This will not significantly alter crop production in the Project Area or Stearns County.

Turbine and facility siting will include discussions with property owners to identify features on their property, including drain tile, which should be avoided. Impacts to drain tile due to Project construction and operation are not anticipated. However, in the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, the tile will be repaired according to the agreement between the Applicant and the owner of any damaged tile.

The Applicant will minimize impacts to CRP land and avoid all impacts to RIM lands.

Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems, including farm systems and utility distribution systems, must be adequately grounded to the earth to ensure continuous safety and reliability, and to minimize this current flow. Potential effects from stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground currents, EMF, or earth currents. Stray voltage is a particular concern for dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals. In those instances where distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment. Black Oak Wind recognizes that this issue may occur, and is committed to siting turbines and power lines to avoid conflicts with dairy farms in the Project Area.

**Mitigative Measures**

Only the land for the turbine, certain electrical equipment, and access roads will be taken out of crop production. Once the wind turbines are constructed, all land surrounding the turbines and access roads may still be farmed. The permanent loss of 13.5 to 20 acres of agricultural land will not result in the loss of any agriculture-related jobs and no net loss of income. Revenue lost from the removal of land from agricultural production will be offset by lease payments to landowners hosting the Project facilities.

In the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, the Applicant will work with affected property owners to repair the damaged drain tile in accordance with the agreement between the Applicant and the owner of any damaged tile.

If CRP land is impacted, the Applicant will work with the landowner and the NRCS to remove the impacted portion of the enrolled parcel from the CRP program. There will be no impacts to RIM land; therefore no mitigation will be necessary.

### 8.10.2 FORESTRY

**Description of Resources**

Economically important forestry resources are not found in this region of Minnesota. Forested areas are primarily associated with homes in the form of woodlots and along the creeks within the Project Area.

**Impacts**

No impacts are anticipated to forestry resources. Since a majority of the woodlots are associated with homesteads, no impacts are anticipated to woodlots.

**Mitigative Measures**

No impacts are anticipated. No mitigation will be necessary.

### 8.10.3 MINING

**Description of Resources**

Sand and gravel resources occur in glacial till and outwash deposits. Many of the pits are inactive, abandoned, or their use is limited to the landowner; there are no active industrial pits or quarries in the Project Area.

Based on MnDOT County Pit Maps and topographic maps for the Project Area, there are no gravel pits located within the Project Area. The closest gravel/aggregate pit is approximately 3 miles to the northeast in Sauk Centre Township (MnDOT 2003).

**Impacts**

Negative impacts to mining are not anticipated. Sand and gravel operations tend to be small and other occurrences of these materials are likely to be present in nearby areas, including large commercial operations in the general area.

**Mitigative Measures**

Towers will not be located within sand and gravel operations.

## 8.11 TOURISM

### 8.11.1 DESCRIPTION OF RESOURCES

Tourism in Stearns County focuses on promoting the area's game and wildlife, lakes, farms, and villages. Also publicized are culture (museums, art, and antiques) and recreation activities (parks, hiking trails, camping, canoeing, horseback riding, fishing, wildlife refuges, snowmobiling, golf courses, swimming pools, tennis courts, and skiing). The County hosts a variety of festivities and cultural events throughout the year.

### 8.11.2 IMPACTS

Because all Project facilities will be located on private lands, there will be no direct impacts to recreational facilities, public lands, or other tourism-related activities. Proposed setbacks from recreational trails, public roads, and non-leased properties (including public lands) will minimize any indirect impacts. The Project is not anticipated to have a significant effect on area tourism.

### 8.11.3 MITIGATIVE MEASURES

Because no significant impacts are anticipated, no mitigation beyond the minimum setbacks is proposed.

## 8.12 LOCAL ECONOMIES

### 8.12.1 ECONOMIC IMPACTS

According to the Stearns County 2030 Comprehensive Plan update, the county's natural resource base and tourism opportunities can "be difficult to balance so as not to over-burden infrastructure or natural resources and conflict with the agricultural base." (Stearns County 2008) The Project will neither overburden infrastructure nor natural resources, and it will balance well with the county's agricultural base.

According to the 2000 U.S. Economic Census (U.S. Census 2000), the largest industries employing residents of Stearns County are health care and social services, manufacturing, and retail.

The 2000 per capita income for Stearns County was $19,211. In general, the per capita incomes are lower in Project Area townships as compared to the Stearns County level. Ashley Township has a lower percentage of poverty (8.3 percent) than Stearns County (10.1 percent). Raymond Township, however, has a higher percentage of poverty than Stearns County at 11.9 percent.

Community benefits associated with the Black Oak Wind Farm closely correspond with Goal 3 within the Economic Development element of the Stearns County Comprehensive Plan. This goal seeks to "strengthen and diversify the agricultural economy" through a variety of objectives, including:

- Objective 1. Strive for and support higher farm profitability and family farm stability, including encouraging creative agricultural diversification of crops and products.
- Objective 3. Create opportunities for new investment in agricultural operations and support industries.

The Project provides landowners and/or farmers with opportunities for higher farm profitability by farming the wind resource to produce energy, thus encouraging creative agricultural diversification of crops and products. Hence, wind energy harvesting is a new investment opportunity in agricultural operations.

Goal 4 of the Economic Development element of the Stearns County Comprehensive Plan seeks to "promote sustainable development initiatives." Objective 5 within Goal 4 states that Stearns County will "(e)ncourage the appropriate development and use of electricity from wind energy as a means of substituting underutilized local renewable resources for non-renewable, non-local, energy sources." Further, the County's Policies and Action Items within the Economic Development element include the

creation of "land use regulation that protects and encourages the expansion of the County's economic diversity." Stearns County has followed this policy by instituting a Wind Energy Conversion System Ordinance in anticipation of wind development opportunities within the county.

### 8.12.2 TAX PAYMENTS

Long-term beneficial impacts to the county's tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of Minnesota. In addition to the creation of jobs and personal income, the Project will pay a Wind Energy Production Tax to the local units of government of $0.0012 per kWh of electricity produced, resulting in an annual Wind Energy Production tax ranging from approximately $147,000 to $168,000.

### 8.12.3 POTENTIAL IMPACTS

**Impacts**

Local contractors and suppliers will be used for portions of the construction. Total wages and salaries paid to contractors and workers in Stearns County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by the Applicant for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the county and the state. Landowners having turbine or other Project facilities on their land will receive a royalty or lease payment annually for the life of the Project. This payment diversifies and strengthens the local economy as discussed below.

**Mitigative Measures**

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during Project construction and an increase in the counties' tax bases from the construction and operation of the wind turbines.

## 8.13 TOPOGRAPHY

### 8.13.1 DESCRIPTION OF RESOURCES

The Project is located in the Hardwood Hills subsection of the Minnesota DNR's Ecological Classification System (Minnesota DNR 2009a. Subsection boundaries delineate a significant regional change in geology, topography, and vegetation. The Hardwood Hills subsection consists of steep slopes, high hills, and lakes formed in glacial end moraines and outwash plains. The Alexandria Moraine Complex forms the western and southern boundaries of this subsection. Kettle lakes frequent the landscape. In the Project Area, elevations range from 1,299 ft to 1,380 ft (395 m to 420 m) above sea level. An elevation map of the Project Area is shown in Figure 8-15 through Figure 8-17.

### 8.13.2 IMPACTS

No impacts to topography are anticipated. Wind turbines and access roads will not require significant excavation or fill.

### 8.13.3 MITIGATIVE MEASURES

No impacts are anticipated, and as such, no mitigative measures are necessary.

## 8.14 SOILS

### 8.14.1 DESCRIPTION OF RESOURCES

Boroll and Aquoll suborder soil types are dominant in this area. The diverse underlying bedrock is covered by 100 to 400 feet of glacial till. The glacial till is calcareous loamy sediment. Soils tend to range from loamy sands to clay loams and are moderately well-drained (DNR 2009b).

One soil association is found within the Project Area (Table 8-14, Figure 8-18 through Figure 8-20). A soil association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape consisting of one or more major soils and other minor soils. The association is named after its major soils.

**Table 8-14. Soil Associations in Project Area**

| Soil Association | Area (acres) |
|---|---|
| Normania-Flom-Roliss (MN 064) | 7,065 |

The Normania-Flom-Roliss Association is a complex of three soil types. Normania soils are loams in slightly concave foot slopes on glacial till plains in cultivated fields. They are somewhat poorly drained with low surface runoff and moderate permeability. Flom soils are silty clay loams with 1 percent plane on nearly level slopes on a glacial till plain in cultivated fields. Flom soils are poorly to very poorly drained with moderately slow permeability and slow surface runoff. Roliss soils are loams with a plane north facing slope of less than 1 percent on a lake plane in a cultivated field. Roliss ranges from poorly to very poorly drained soil with negligible to low surface runoff and moderate to moderately slow permeability (U.S. Department of Agriculture 2009c).

### 8.14.2 IMPACTS

Construction of the wind turbines and access roads will increase the potential for soil erosion during construction and convert prime farmland from agricultural uses to industrial uses. The amount of land that will be converted to wind turbines, transformer pads, and access roads will be determined once the site layout has been finalized. See Section 8.10.1 for a discussion of impacts to prime farmland.

### 8.14.3 MITIGATIVE MEASURES

A National Pollutant Discharge Elimination System (NPDES) permit application to discharge stormwater from construction facilities will be acquired by the Applicant from the MPCA. Best Management Practices (BMP) will be used during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containment of excavated material, protection of exposed soil, and stabilization of restored material. A Stormwater Pollution Prevention Plan (SWPPP) will be developed prior to construction that will include BMPs such as silt fencing, revegetation plans, management of exposed soils to prevent erosion.

# 8.15 GEOLOGIC AND GROUNDWATER RESOURCES

## 8.15.1 DESCRIPTION OF RESOURCES

**Surficial Geology**

Surficial geology of the Project Area consists of glacial deposits associated with the Des Moines Lobe. The Project Area is covered by till deposits described chiefly as loam-textured, unsorted sediment with scattered pebbles, cobbles, and boulders. Thin beds of silty clay to gravelly sand are common in places. The east side of the Project Area is considered pitted supraglacial till where the land surface is characterized by close depressions. It is commonly overlain by three feet or more of loamy to clayey, organic-bearing colluviums in low lying areas. The west side of the Project Area contains till that has been modified by water action, and, in places, is mantled by silt, sand, or gravel. Thickness of the surficial deposits range from 150 to 200 feet across the Project Area (Minnesota Geological Survey 1995).

**Bedrock Geology**

The bedrock underlying the glacial material consists of a granitoid gneiss from the Archean Eon. This unit is described as a predominantly pink to pinkish-gray quartzofelspathic gneiss from granite to granodioritic origins. Outcropping of this unit can be found approximately 1 mile to the northwest (Minnesota Geological Survey 1995).

**Aquifers**

Groundwater in the region is supplied by unconfined and confined (buried) glacial aquifers. The glacial aquifers in the Project Area are generally unconfined and are considered low yield with less than 100 gallons per minute. The water table is shallow with an elevation of approximately 1,340 feet above mean sea level (AMSL) (0 to 20 ft below ground surface across the site) and groundwater flow directed easterly. Portions of the Project Area are underlain by a buried sand and gravel aquifer, identified as Aquifer 1. The thickness of this aquifer ranges from 20 to 30 feet and is has been used for domestic, industrial, and municipal uses (DNR 1998).

**Aggregate Sources**

No active gravel pits or mines are present in the Project Area. The nearest active site is a gravel pit located approximately 3 miles to the northeast in the northeast quarter of Section 28, Township 126 North, Range 34 West (MnDOT 2003).

## 8.15.2 IMPACTS

Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be quite limited. O&M water requirements will be satisfied with either a well or rural water service.

## 8.15.3 MITIGATIVE MEASURES

Wind turbine locations will not impact the use of existing water wells because the turbines will be set back from occupied structures according to state and county standards.

## 8.16 SURFACE WATER AND FLOODPLAIN RESOURCES

### 8.16.1 DESCRIPTION OF RESOURCES

Surface water and floodplain resources for the Project Area were identified by reviewing U.S. Geological Survey (USGS) topographic maps, and Minnesota Public Waters Inventory (PWI) maps. Major surface waters located within the Project Area are part of the Sauk River Watershed, which is a tributary to the Sauk River and the North Fork Crow River Watershed, which is a tributary to the Crow. Also within the Project Area are a number of unnamed intermittent and perennial streams that are designated waters of the United States. Five (4 partially and 1 completely) PWI waters are located partially or completely inside the Project Area. The largest, Raymond Lake, is connected to a larger PWI complex which is part of the Padua WMA. Figure 8-21 through Figure 8-23 show the locations of surface waters, Minnesota Public Waters, National Wetland Inventory wetlands, and Shoreland Overlay Districts within the site.

**Wildlife Lakes in and Adjacent to Project Boundary**

There are no DNR designated "Wildlife Lakes" in or adjacent to the Project boundary.

**FEMA Floodplains within Project Area**

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps have been created within the Project Area (FEMA 2009). There are no 100-year floodplains within the Project Area; the closest floodplain is associated with the Sauk River, as shown on Figure 8-21 through Figure 8-23.

### 8.16.2 IMPACTS

Construction of the wind turbines, transformer pads, and access roads will disturb land within the Project Area. The wind turbines, step-up substation, and O&M facility will be built on higher elevations, avoiding lakes and streams located in the lower positions in the landscape. Access roads, electrical power lines, and underground cabling will be designed to minimize impacts to streams.

### 8.16.3 MITIGATIVE MEASURES

If the Project will impact waters of the U.S. or Minnesota Public Waters, the Applicant will apply for the necessary permits prior to construction. Access roads constructed adjacent to streams and drainageways will be designed in a manner such that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and an NPDES permit will be obtained prior to the Project construction. No Project activities will occur within the Shoreland Overlay District of any water within the Project site (Figure 8-21 through Figure 8-23).

## 8.17 WETLANDS

### 8.17.1 DESCRIPTION OF RESOURCES

Wetlands near the Project Area were identified by reviewing National Wetland Inventory (NWI) maps and Minnesota PWI maps. Some of the wetlands are associated with creeks and unnamed intermittent streams within the site and some of the wetlands are isolated basins. The NWI wetland types and their acreage within the Project Area are presented in Table 8-15.

**Table 8-15. NWI Wetland Type and Acreage**

| NWI Type | | Acreage |
|---|---|---|
| **Freshwater Emergent Wetland** | PEMA | 9.2 |
| | PEMAd | 285.1 |
| | PEMC | 31.6 |
| | PEMCd | 181.0 |
| | PEMCx | 0.3 |
| | PEMF | 30.6 |
| | PEMFd | 41.7 |
| | PEMFx | 0.2 |
| | PEM/UBF | 4.1 |
| | **Total** | **583.8** |
| **Freshwater Forested/Shrub Wetland** | PFO1C | 2.9 |
| | PFO1Cd | 0.8 |
| | PSS1C | 0.4 |
| | PSS1Cd | 16.1 |
| | **Total** | **20.2** |
| **Freshwater Pond/Lake** | PUBF | 1.9 |
| | PUBFx | 8.2 |
| | L1UBH | 0.06 |
| | **Total** | **10.2** |
| **Wetland Total** | | **614.2** |

[1] *Wetland acreage is calculated using USFWS NWI data.*

There are a total of 614 acres of NWI wetlands in the Project Area; approximately 8.7 percent of the Project area. More than 95 percent (584 acres) of the mapped NWI wetland acreage is freshwater emergent wetlands. The remaining 5 percent of mapped NWI wetlands are freshwater forested/shrub wetlands (20 acres) and freshwater ponds or lake (10 acres). A total of 35.89 acres of PWI wetlands and lakes are located within the Project Area. There may be overlap between NWI and PWI waters. See Figure 8-21 through Figure 8-23 for locations of wetlands within the site.

### 8.17.2 IMPACTS

Wind turbines, the step-up substation, and the O&M facility will be built on high elevations, avoiding wetlands on the lower positions in the landscape. Access roads and the electrical collection system will be designed to minimize impacts to wetlands.

### 8.17.3 MITIGATIVE MEASURES

Formal wetland delineations of the Project Area will be completed prior to construction, and the layout will be designed to avoid and minimize wetland impacts. Wetlands will be avoided to the extent possible during the construction phase of the Project. If wetland impacts cannot be avoided, the Applicant will

submit Section 404 and Minnesota Wetland Conservation Act permit applications to the U.S. Army Corps of Engineers and the state prior to construction.

## 8.18 VEGETATION

### 8.18.1 DESCRIPTION OF RESOURCES

The Native Plant Communities and Rare Species of Stearns County Map (DNR, 2005) identifies the areas of Stearns County as historically dry or mesic prairie and wet prairie (includes marshes, swamps, wet meadows, and fens). Currently, the Project Area is mostly disturbed agricultural lands. No areas of native prairie, mesic prairie, or wet meadow are mapped within the Project Area.

As a result of settlement in the mid-1800s, the area was converted to farmland. During this process, the wetland areas were frequently ditched and drained. Only a small fraction of the original prairie, wetlands, and upland forests remain as relic habitats (DNR 2009a). Trees were planted by landowners for shelter belts (windrows and homestead groves) or were established by natural means – transported to the area by animals, birds, or wind (wooded ravines).

Based on review of aerial photographs, land use database information, and a visit to the Project Area, HDR determined that the majority of the land area at the site is cultivated. The grassland and wetland areas at the site may contain potential remnant native prairie areas. Native prairie is identified as lands that have never been plowed, with less than 10 percent tree cover, and presence of native prairie vegetation. Unplowed fields of native grassland or pasture, with 10 or more prairie plant indicator species, are considered to be prairie for the purposes of this application. A list of prairie indicator species can be found in the Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Provinces, Minnesota Department of Natural Resources, 2005. The relative abundance of the major habitats in the Project Area is shown in Table 8-16 (GAP Data, USGS 2004).

**Table 8-16. Major Habitats and their Relative Abundance in the Project Area**

| Habitat | | Sum of Area (acres) | Percent of Project Area |
|---|---|---|---|
| Aquatic | Aquatic | 1.8 | 0.03 |
| | Marsh | 78.1 | 1.10 |
| | **Total** | **79.8** | **1.1** |
| Crop/Grass | Cropland | 5,916.5 | 83.7 |
| | Grassland | 1,015.3 | 14.3 |
| | **Total** | **6,931.8** | **98.0** |
| Forest/Shrub | Black Ash | 4.2 | 0.06 |
| | Shrubland | 46.5 | 0.66 |
| | Aspen/White Birch | 1.1 | 0.02 |
| | Oak | 0.40 | 0.01 |
| | **Total** | **52.3** | **0.9%** |
| **Project Total** | | **7,063.9** | **100.0** |

Crops include corn, soybeans, alfalfa, clover, wheat, oats, and hay. Range and pasture lands are used to graze cattle and horses. Heavily grazed range/pasture lands contain Kentucky bluegrass (*Poa pratensis*), quack grass (*Elytrigia repens*), and brome grasses (*Bromus spp.*). Lightly grazed or undisturbed range land may contain native grass species including big blue stem (*Andropogon gerardii*), needle grass (*Stipa spp.*), and gramma grass (*Bouteloua spp.*).

CRP land is discussed in Section 8.10.1 and may be present within the Project Area. CRP land is typically covered by brome grasses, orchard grass, and alfalfa. Land is typically put into CRP for 10-year cycles.

Approximately 6 acres of the site is forest, according to USGS GAP land cover data. This can be further broken down as 0.40 acres of oak (*Quercus spp.*), 4.2 acres of black ash (*Fraxinus nigra*), and 1.1 acres of aspen (*Populus tremuloides*) /white birch (*Betula papyrifera*). Generally, the wooded areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings.

### 8.18.2 IMPACTS

A summary of impacts is provided in Table 8-17. The amount of vegetation that will be removed as a result of the Project will be determined once a site layout is finalized, but the vast majority is anticipated to be crop land. Vegetation will be permanently removed and replaced by wind turbines, access roads, and substation components. The Project will likely also involve building a new O&M facility. Additional areas may also be temporarily disturbed for the installation of underground power lines during construction. Approximately 6 acres of land will be temporarily impacted for contractor staging and lay-down areas. Temporarily disturbed areas will be reseeded to blend with existing vegetation. The turbines will avoid forests and groves to maximize turbine output and reduce tree removal. Avoidance and minimization of impacts to wetlands and native prairies will reduce impacts to those vegetated areas.

**Table 8-17. Summary of Estimated Permanent Impacts to Vegetation (Acres)***

| Turbine Model | Turbine Impact | Access Road Impact | Operation and Maintenance Facility Impact | Substation Impact | Total |
|---|---|---|---|---|---|
| GE 1.6xle 1.6 MW | 1.6 | 12.5 | 3.0 | 3.0 | 20.0 |
| Vestas V90 1.8 MW | 1.4 | 11.0 | 3.0 | 3.0 | 18.4 |
| Vestas V112 3.0 MW | 0.8 | 6.7 | 3.0 | 3.0 | 13.5 |

**Vegetation proposed for permanent impact will be primarily cropland.*

### 8.18.3 MITIGATIVE MEASURES

The following measures will be used to avoid and minimize potential impacts to agricultural land of the Project area during siting, construction, and operation:

- Conduct a preconstruction inventory of the Project Area for existing WPAs, WMAs, SNAs, recreation areas, wetlands, native prairie, and forests. The preconstruction inventories will have varying levels of detail with the most specific detail in the vicinity of construction;
- Exclude established WMAs, WPAs, SNAs, and recreation areas from consideration for wind turbine, access road, or electrical line placement;
- Avoid disturbance of wetlands during construction and operation of the Project. If jurisdictional wetland impacts are proposed, then the Applicant will apply for wetland permits;

- Minimize the need to clear existing trees and shrubs;
- Use BMPs during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, revegetating non-cropland and range areas with wildlife conservation species and, wherever feasible, planting native tall grass prairie species in cooperation with landowners; and
- If the final layout includes native prairie impacts, the Applicant shall, in consultation with the DNR, and others selected by the Applicant, prepare a prairie protection and management plan. The plan will be submitted to the PUC and DNR after issuance of the site permit and prior to construction. The plan shall address steps to be taken to identify native prairie within the Project Area, measures to avoid impacts to native prairie, and measures to minimize and mitigate for impacts if unavoidable. Wind turbines and all associated facilities, including foundations, access roads, underground cable, and transformers, shall not be placed in native prairie unless addressed in the prairie management plan. Measures to be taken to mitigate unavoidable impacts to native prairie will be agreed to by the Applicant and DNR.

## 8.19 WILDLIFE

### 8.19.1 DESCRIPTION OF RESOURCES

Information on the existing wildlife in the proposed wind farm area was obtained from a variety of sources including DNR, USFWS, Minnesota Ornithologist's Union County Checklists, and avian and bat preconstruction surveys conducted at GWE's proposed Paynesville Wind Farm (Hamer, 2010). Because the Paynesville Wind Resource Area (PWRA) is located in close proximity to the Project Area (approximately 17 miles southeast), the Paynesville studies provide a recent and relevant assessment of wildlife resources in the area. The following sections include a discussion of general wildlife that occurs in the Project Area. Section 8.20 includes a discussion of wildlife considered by the state to be threatened, endangered, or of special concern.

Wildlife in the Project Area consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which use Project Area habitat for forage, breeding, and/or shelter. The resident species are representative of Minnesota game and non-game fauna that are associated with upland grass, farmlands, and wetland and forested areas. The majority of the migratory wildlife species are birds, including waterfowl, raptors, and songbirds.

Eighteen WMAs and one SNA are located within ten miles of the Project boundary (Figure 8-8 through Figure 8-10). WMAs provide habitat, breeding area, and food supply for many types of wildlife. WMAs are state-owned and managed by the DNR to protect and enhance wildlife habitat. Animal populations are expected to be denser in these areas, including bird and bat populations. SNAs are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values. See Section 8.7.1 for further discussion on WMAs and SNAs near the Project Area.

WPAs are managed by the USFWS to protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems. There are thirty-four WPAs within ten miles of the Project boundary; the Behnen WPA is located adjacent to the Project Area.

RIM land involves the acquisition and enhancement of critical habitat. No RIM easements are located within or adjacent to the Project Area (BWSR 2010). CRP land may also be located within or in the vicinity of the Project Area. Included below is a discussion of migratory and resident birds, mammals, reptiles, amphibians, and insects that are expected to exist in the Project Area.

The DNR has identified one Regionally Significant Ecological Area (RSEA) partially within the Project Area, associated with and extending north of the Padua WMA (Figure 8-24 through Figure 8-26). Another RSEA is adjacent to, but outside of the Project Area, within the Behnen WPA. RSEAs are areas of natural land cover (less than 4 percent impervious surface and no maintained vegetation such as agriculture or short grass) identified by the DNR based on the shape and size of the area, and their adjacent land use and connectivity to other natural areas. All intact native plant communities mapped by the Minnesota County Biological Survey (MCBS) are included as an RSEA, although not all RSEAs are MCBS communities.

**Birds**

Various migratory and resident bird species use the Project Area as a part of their life cycle. Migratory bird species may use the Project Area for resting, foraging, or breeding activities for only a portion of the year. Resident bird species occupy the proposed wind farm site throughout the year. A list of migratory and resident bird species documented by the USGS Breeding Bird Survey (BBS) in the vicinity of the Project Area is presented in Appendix D. The results of the preconstruction avian survey that GWE conducted for the Paynesville Wind Farm (see Appendix D), also in Stearns County, show that the site-specific avian point-count data contain a similar species composition to those listed in the nearest BBS route (New London route). Therefore, it is anticipated that the species listed in the nearest BBS route to this Project (also the New London route) will be representative for bird use in the Project Area.

Upland game birds in the region include ring-necked pheasant (*Phasianus colchicus*) and mourning dove (*Zenaida macroura*). Common raptors in the region include red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and northern harrier (*Circus cyaneus*).

**Mammals**

A list of species that have a potential to occur in the Project Area is presented in Appendix D. These species use the food and cover available from agricultural fields, grasslands, farm woodlots, wetland areas, and wooded ravines. Grassland areas and woody vegetation are also habitat for a variety of small mammals. White-tailed deer (*Odocoileus virginianus)*, an economically important species, have a strong affinity for agricultural crops and use farm woodlots, wooded ravines, and intermittent stream bottoms for shelter.

Bat species present in Minnesota include the hoary bat (*Lasiurus cinereus)*, eastern red bat (*Lasiurus borealis)*, big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans)*, northern myotis

(*Myotis septentrionalis*), eastern pipistrelle (*Pipistrellus subflavus*), and little brown bat (*Myotis lucifiugus*). The results from preconstruction bat acoustical surveys for GWE's Paynesville Wind Farm recorded calls from the silver-haired/big brown bat species group (which make up the majority of the calls), hoary bats, eastern red bats, and little brown bats. It is anticipated that a similar mix of bat species will be found in the vicinity of the Black Oak project.

**Reptiles and Amphibians**

Reptile and amphibian species that may be present in the Project Area include many snakes, frogs, and turtles. A list of reptile and amphibian species that may use the grassland, wetland, and forested areas in the Project Area is presented in Appendix D.

**Insects**

While many insect species are important to the cultivated vegetation and wildlife, honeybees are the only species in the Project Area that are economically important. Honeybees are considered a small but important part of central Minnesota's economy. Statewide, production from 130,000 colonies was valued at around $9 million in 2007 (U.S. Department of Agriculture 2009a). Butterfly species are associated with native prairie plants.

### 8.19.2 IMPACTS

Development of the wind farm, including the construction and operation, is expected to produce a minimal impact to wildlife. Based on studies of existing wind power projects in the United States and Europe, the impact to wildlife would primarily occur to avian and bat populations. The final report for the PWRA (Hamer, 2010) concluded that similar to other wind developments, there is a high likelihood that individual bird fatalities will occur at the PWRA, but that it is unlikely to affect populations of most species, especially at a regional scale. The report concluded that the three by five times the rotor diameter setbacks from public lands (WMAs and WPAs) based on OES siting guidelines should be adequate to reduce risk to waterfowl/waterbirds and grassland-associated birds when siting turbines within the PWRA project area. These recommendations were based on a review of relevant studies of existing wind energy facilities. Similar to the PWRA, grassland (including potential native prairie) and wetlands with semipermenant and permanent open water within the Black Oak Project vicinity are limited to the WMAs, WPAs, and RSEAs. These areas will be avoided.

Few recent studies are available in comparable landscapes that provide both pre- and post-construction data from which to draw correlative inferences about potential impacts. The final report (WEST 2000) on avian monitoring studies at the Buffalo Ridge Wind Resource Area (WRA), Minnesota from 1996 to 1999 provides the most recent and relevant data available for potential impacts at the Black Oak Wind Farm. The purpose of these studies was to evaluate the risk to birds from each phase of development and the cumulative risk to birds from all wind power development in the Buffalo Ridge WRA. Although the Buffalo Ridge WRA is located approximately 120 miles from the Project area, the general species composition and land cover is similar. Both areas are generally a mixture of crop fields growing corn, soybeans, small grains, and hay; pasture; and CRP lands. As a comparison, Table 8-18 lists the 10 most commonly observed species along the Tyler BBS route, located within the Buffalo Ridge WRA, and the

closest BBS route to the Project Area (New London). Based on the BBS routes, the Project Area has a similar species composition to the Buffalo Ridge WRA.

**Table 8-18. Top 10 Most Frequently Recorded Species in BBS Routes**

| New London Route (Stearns County) | | | Tyler Route (Buffalo Ridge) | | |
|---|---|---|---|---|---|
| Bird Est.* | Common Name | Scientific Name | Bird Est.* | Common Name | Scientific Name |
| 169 | Red-winged blackbird | *Agelaius phoeniceus* | 171 | Red-winged blackbird | *Agelaius phoeniceus* |
| 122 | Common grackle | *Quiscalus quiscula* | 67 | Common grackle | *Quiscalus quiscula* |
| 67 | Common yellowthroat | *Geothlypis trichas* | 48 | Western meadowlark | *Sturnella neglecta* |
| 66 | Mourning dove | *Zenaida macroura* | 32 | Mourning dove | *Zenaida macroura* |
| 60 | European starling | *Sturnus vulgaris* | 29 | Ring-necked pheasant | *Phasianus colchicus* |
| 46 | Horned lark | *Eremophila alpestris* | 20 | American robin | *Turdus migratorius* |
| 42 | American robin | *Turdus migratorius* | 20 | American crow | *Corvus brachyrhynchos* |
| 42 | Cliff swallow | *Petrochelidon pyrrhonota* | 18 | Cliff swallow | *Petrochelidon pyrrhonota* |
| 36 | Grasshopper sparrow | *Ammodramus savannarum* | 14 | Barn swallow | *Hirundo rustica* |
| 33 | Ring-necked pheasant | *Phasianus colchicus* | 14 | Mallard | *Anas platyrhynchos* |

*Source: New London: http://www.mbr-pwrc.usgs.gov/cgi-bin/rtena23.pl?50064; Tyler: http://www.mbr-pwrc.usgs.gov/cgi-bin/rtena226.pl?50062*
**Estimated number of birds a very good birder would encounter in about 2.5 hours of birding along the BBS "New London" or "Tyler" routes.*

The Buffalo Ridge Study identified the following impacts:

- Following construction of the wind turbines there is a reduction in use of the area within 100 meters of the turbines by about 32 percent of species of grassland breeding birds. It was hypothesized that lower avian use may be associated with avoidance of turbine noise, maintenance activities, and less available habitat. The researchers stated that "on a large scale basis, reduced use by birds associated with wind power development appears to be relatively minor and would not likely have any population consequences on a regional level."
- Avian mortality appears to be low in the vicinity of the project area at nearby Buffalo Ridge WRA compared to other wind facilities in the United States (WEST 2001 and 2002). They found an overall avian mortality of 0.98 birds per turbine per year. Avian mortality is primarily related to nocturnal migrants. Resident bird mortality is very low and involves common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint."

- Bat mortality was studied at the Buffalo Ridge WRA in 2001 and 2002 by WEST. They found an overall mortality average of 2.16 bats/turbine/year. Approximately 82 percent of the bat mortality occurred from mid-July to the end of August. WEST found that "both the bat detector and mist net data indicate there are relatively large breeding populations of bats in close proximity to the wind plant that experienced little to no wind plant related collision mortality." It appears that most bat mortality at Buffalo Ridge involves migrating bats. Researchers highlighted that bat mortality increased with reduced distance between turbines and wetlands or woodlands. Turbines in this study were 750 KW turbines with a 50 meter tower and RD of 46 or 48 meters, depending on blade length. Turbines would be larger at the Black Oak Wind Farm.

Results of the preconstruction survey for GWE's Paynesville Wind Farm show that the mean number of bat calls per detector per night is lower than many of those observed at other wind resource areas for which preconstruction and postconstruction surveys have been completed (Hamer, 2010). Compared specifically to the Buffalo Ridge WRA study, the mean number of calls recorded at the Paynesville Wind Farm is higher than the number of calls recorded at sites close to Buffalo Ridge turbine areas, but are lower than those recorded outside of the Buffalo Ridge WRA project boundary. Given the similar habitat types, and proximity of the Black Oak project to the Paynesville project, it is anticipated that the general bat use at Black Oak is similar to that recorded at Paynesville.

Results of post-construction mortality monitoring at the more recent Top of Iowa WRA also indicated low impacts to waterfowl species. Similar to the Project Area, the Top of Iowa wind development is located in an agricultural area with several WMAs interspersed through and adjacent to the WRA, providing wetland, grassland, and woodland habitat. During pre-construction surveys, the area had high shorebird, passerine, and migrant and resident waterfowl utilization. No waterfowl fatalities were found on extensive searches there (Koford et al. 2004, Jain 2005).

Ranges of estimated avian mortality (resident and migratory) observed for a sample of wind-energy projects in the U.S. (National Research Council 2007) are from 1 to 12 birds per MW per year, which is higher than found at the Buffalo Ridge WRA. However, many of these estimates are based on older generation wind energy facilities which typically have higher MW/year fatality rates compared to newer-generation turbines, which, while taller and having more wind-swept area, also have rotor-blades that move slower, are easier to see, and have other features that apparently reduce avian mortality (Erickson et al. 2002, Smallwood and Karas 2009). Postconstruction mortality studies at other sires, including the Buffalo Ridge WRA, indicated that collision events will likely be much lower than national averages.

Based on the results of previous studies, the land cover types within the Project Area, and the similarity of species composition between the Buffalo Ridge WRA, the Paynesville WRA, and the Project Area, the impact of the proposed Project on wildlife is expected to be minimal. There is potential for avian and bat collisions with facility turbines or meteorological towers. Additional impacts may include a small reduction in the available habitat that some wildlife uses for forage or cover; however, operation of the wind farm will not change the existing land use.

### 8.19.3 MITIGATIVE MEASURES

The Applicant will implement the following measures to the extent practicable to help avoid potential impacts to wildlife in the Project Area during selection of the turbine locations and subsequent Project development and operation:

- Conduct a preconstruction inventory of existing biological resources, native prairie, and wetlands in the Project Area.
- Exclude the RSEA in Section 13, Raymond Township from consideration for wind turbine, access road, or feeder/collector line placement.
- Maintain, at a minimum, the three by five times the rotor diameter setback from WMAs and WPAs to reduce risk to waterfowl/waterbirds and grassland-associated birds when siting turbines in the Project Area.
- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction. Wetland delineations will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.
- Avoid or minimize placement of turbines in high quality native prairie tracts. Based on preliminary site observations conducted by HDR, these tracts are limited to public lands (WPAs, WMAs, and SNAs) that are excluded from the Project Area. The DNR noted in their July 6, 2010 letter that an area of wet prairie is present in the north and west portions of Section 11, Raymond Township; this area will be avoided. Additionally, areas that will be temporarily or permanently disturbed for Project activities will be evaluated prior to construction by field surveys to identify any high quality native prairie remnants.
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines. These will be identified based on aerial photos and during field surveys.
- Avoid construction activities within deer-wintering yards during winter.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, BMPs for erosion and sediment control will be used. These practices include silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Construct wind turbines using tubular monopole towers.
- Light turbines according to FAA requirements.
- Revegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate native seeding mix.
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project.
- Prepare and implement an Avian and Bat Protection Plan during construction and operation of the Project. This plan will consist of GWE's corporate standards for minimizing impacts to avian and

bat species during construction and operation of wind energy projects, which will be developed in a manner that is consistent with the guidelines and recommendations of the Wind Turbine Guidelines Advisory Committee's Recommended Guidelines to the U.S. Fish and Wildlife Service (March 4, 2010). It will include GWE's commitments to wind farm siting and transmission route suitability assessments, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training.

The Applicant is committed to minimizing wildlife impacts within the Project Area. Black Oak Wind will design their facility to minimize avian impacts by avoiding high use wildlife habitat (woodlands adjacent to farmsteads and WMAs/WPAs), using tubular towers to minimize perching, placing electrical collection lines underground as practicable, and minimizing infrastructure. Black Oak Wind continues to consult with the PUC, USFWS, and DNR regarding appropriate mitigation measures for wildlife impacts.

### 8.19.4 REGULATORY ENVIRONMENT

**Migratory Bird Treaty Act**

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-712) regulates the taking, selling, transporting, and importing of migratory birds, their nests, eggs, parts, or products. The MBTA protects more than 800 species of birds that occur within the U.S. A list of federally protected migratory birds may be found in 50 CFR Part 10.13. Most birds within the Project would be afforded protection under this act.

**USFWS Wind Turbine Advisory Committee Recommendations**

The Wind Turbine Guidelines Advisory Committee (WTGAC) was established in 2007 under the Federal Advisory Committee Act to provide advice and recommendations to the Secretary of the Interior on developing effective measures to avoid or minimize impacts to wildlife and their habitats related to land-based wind energy projects. On March 4, 2010, the WTGAC submitted to the Secretary of the Interior its policy recommendations and recommended guidelines. The recommendations were developed over a two-year period by a consortium of agency and wind industry experts, and provide the most current and comprehensive guidance for evaluating potential wildlife impacts from a proposed wind energy facility.

The WTGAC's guidelines are founded upon a tiered approach for assessing potential impacts to wildlife and their habitats. The tiered approach is an iterative decision-making process for collecting information in increasing detail, quantifying the possible risks of proposed wind energy projects to wildlife and habitats, and evaluating those risks to make siting, construction, and operation decisions. Subsequent tiers refine and build upon issues raised and efforts undertaken in previous tiers. At each tier, a set of questions is provided to help the developer identify potential problems associated with each phase of a project, and to guide the decision process. The tiered approach is designed to assess the risks of project development by formulating questions that relate to site-specific conditions regarding potential species and habitat impacts. The tiers are outlined briefly as:

- Tier I: Preliminary evaluation or screening of sites (landscape-level screening of possible project sites; generally based on readily available public information)

- Tier II: Site characterization (comprehensive characterization of one or more potential project sites; generally based on consulting with the appropriate agencies/authorities and one or more reconnaissance level site visits by a wildlife biologist)
- Tier III: Field studies to document site wildlife conditions and predict project impacts (site-specific assessments at the proposed project site; quantitative and scientifically rigorous studies; e.g., acoustical monitoring, point count avian surveys, raptor nest surveys, lek surveys, etc.)
- Tier IV: Postconstruction mortality studies (to evaluate direct fatality impacts)
- Tier V: Other postconstruction studies (to evaluate direct and indirect effects of adverse habitat impacts, and assess how they may be addressed; not done for most projects; e.g., post-construction displacement and/or use studies, curtailment effectiveness studies, etc.)

This tiered approach allows developers to determine whether they have sufficient information, whether and/or how to proceed with development of a project, or whether additional information gathered at a subsequent tier is necessary to make those decisions. The WTGAC indicated that wind energy developers who voluntarily adhere to these guidelines will be undertaking a robust level of wildlife impact analysis, and have a shared responsibility with the USFWS to ensure that the scientific standards of the guidelines are upheld and used to make wise development decisions.

It is important to note that not all of the five tiers are recommended or necessary for all projects.

At each tier, potential issues associated with developing or operating a project are identified and questions formulated to guide the decision process. The guidelines outline the questions to be posed at each tier, and recommend methods and metrics for gathering the data needed to answer those questions. If sufficient data are available at a particular tier, the following outcomes are possible based on analysis of the information gathered:

- The project is abandoned because the risk is considered unacceptable,
- The project proceeds in the development process without additional data collection,
- An action, or combination of actions, such as project modification, mitigation, or specific post-construction monitoring, is indicated.

If data are deemed insufficient at a tier, more intensive study is conducted in the subsequent tier until sufficient data are available to make a decision to abandon the project, modify the project, or proceed with and expand the project (USFWS 2010).

**Results of Tier I and II Process**

A Tier I and II Site Characterization Study (SCS) was completed for the proposed Project in June 2010. The study was based on off-site resources, a site visit by a qualified biologist on July 8, 2009, a meeting with the DNR and USFWS on July 21, 2009, and solicitation of written comments from the DNR in November 2008 and June 2010. Information obtained for the SCS is summarized in Sections 8.18.1 and 8.19.1. Based on the results of the SCS, no Tier III studies are being proposed for the Project. This decision was reached by answering the following questions from the WTGAC guidelines:

*Are there known species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?*

After examining the available public records, Black Oak Wind found no known records of native plant communities (in DNR Natural Heritage records) or federal- or state-listed species or designated critical habitat within the Project boundary. Three records of state-listed species of special concern are located within 1 mile of the boundary (Figure 8-24 to Figure 8-26). The majority of the Project Area (more than 83 percent) is in active crop production. Intact natural habitat consists of scattered wetlands, a remnant wet prairie in Section 11 (Raymond Township) identified during a site visit by the DNR (Appendix E), and small remnants of woodland areas that are primarily located adjacent to farmsteads. There are no WMAs or WPAs within the Project boundary; three WPAs and one WMA are within 1 mile of the Project boundary. The Behnen WPA is directly adjacent to the northwest Project boundary, the Trisko WPA is approximately 0.5 miles west of the Project, and the Wiener WPA is located 0.7 miles northwest of the Project. The Padua WMA is less than 0.5 miles southeast of the Project.

The RSEA within the Project boundary is ranked as a "3" in the DNR database, which is the highest rank given to RSEAs and is based on land cover characteristics; it is listed as "below ranking" on the MCBS, indicating the lowest quality habitat recognized as an MCBS community. The RSEA within the Behnen WPA is ranked as a "2," the middle rank given by the DNR; it is also listed as a "moderate" quality MCBS site. While these tracts represent ecologically intact areas, in the context of the Project Area they are relatively isolated from other intact communities by surrounding crop land. Black Oak Wind will avoid all of these features by siting project infrastructure in upland, non-wooded areas outside of the RSEAs.

*Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: areas of scientific importance; areas of significant value; federally-designated critical habitat; high-priority conservation areas for NGOs; or other local, state, regional, federal, tribal, or international organizations.*

Black Oak Wind found that the outstanding quality RSEA located in the southwest quarter of Section 13, Raymond Township, is the only area within the Project boundary that has been designated by a state agency or other organization as ecologically significant habitat. As described in the response to the previous question, Black Oak Wind will avoid impacts to this area. There will be no direct impacts to the WPAs, WMAs, or RSEAs within 1 mile of the Project boundary, and setbacks from the Project perimeter will result in a minimum buffer between these resources and any turbines.

*Are there plant communities of concern present or likely to be present at the site(s)?*

Black Oak Wind did not find areas of native prairie within the Project boundary during the July 8, 2009 site visit. While small remnants of wooded areas were identified during the site visit, they are generally located adjacent to farmsteads and will not be affected by Project activities. DNR staff noted the presence of a wet prairie in Section 11, Raymond Township. This area will be avoided.

*Are there known critical areas of congregation of species of concern, including, but not limited to: maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?*

Black Oak Wind found that there are no Natural Heritage Information System (NHIS) records of maternity roosts, hibernacula, or colonial waterbird nesting sites on the Project site or within 5 miles of the Project boundary. In their July 6, 2010, response letter, DNR staff indicated that visiting and migrating waterbirds such as tundra swans, ring-necked ducks, mallards, and Canada geese were observed in March 2010 on a site adjacent to and east of the Project boundary. The DNR and USFWS have indicated that the wetlands and adjacent habitat within the WPAs and WMAs that are located within 1 mile of the Project boundary attract birds on a seasonal basis. Additionally, DNR staff noted that observations of tundra swans in a seasonally flooded, cropped wetland in an adjacent section indicate the possibility of similar seasonal use of wetlands within the Black Oak Project boundary.

*Using best available scientific information, has the relevant federal, state, tribal, and/or local agency independently demonstrated the potential presence of a population of a species of habitat fragmentation concern? If not, the developer need not assess impacts of the proposed project on habitat fragmentation.*

Through the consultation process, Black Oak Wind found no specific species of habitat fragmentation concern has been identified by the USFWS or DNR. Because the area is already highly fragmented by agricultural uses and few intact natural communities exist within the Project Area, the risk of additional habitat fragmentation is minimal.

*Which species of birds and bats, especially those known to be at risk from wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?*

The complete list of birds from the closest BBS route to the Project area (New London Route) is included in Appendix D. In addition, the species list of birds from the Minnesota Breeding Bird Atlas (MBBA) blocks that partially occur within the Project boundary is included in Appendix D. The avian and bat preconstruction survey conducted for GWE's Paynesville WRA (see Appendix D), indicated that species composition is similar to the BBS summaries, which supports the use of BBS data for predicting avian composition in the Project site. The July 6, 2010, DNR letter lists several species noted during a one day site visit, including bird species commonly found in agricultural and wetland settings; some grassland bird species (savannah sparrow, dickcissel, and LeConte's sparrow) were also observed by DNR staff.

**Summary of Tier I and Tier II Process**

Because adequate data currently exists to address the Tier I and II questions, no Tier III studies are necessary to gather more information for the Project. Based on the minimal extent of intact natural communities and lack of known records of listed species within the Project boundary, the risk of significant wildlife impacts is minimal. The wet prairie identified by DNR staff will be avoided. While potential waterbird congregation areas noted by the DNR and USFWS are present in the Behnen and Trisko WPA areas, these are located outside of the Project boundary, and direct impacts will be avoided.

The Raymond Lake/Padua WMA/RSEA complex is partially within the Project boundary, but because most of Section 13, Raymond Township, has very low topographic elevation, the lake complex will effectively be buffered from proposed turbines. Although it is possible that wetlands, including cropped wetlands, within the Project boundary are used as stopover sites during spring migration as the DNR noted, the wetlands within the Project boundary are similar in size, quality and density to those in the adjacent landscape. Because the Project site has landscape features and cover types similar to both the Buffalo Ridge and Paynesville WRAs, there is substantial existing data available to predict avian and bat impacts from comparable sites. Therefore, no additional studies are proposed for the Project. Black Oak Wind will continue to coordinate with the USFWS and DNR on issues addressed in the Tier I and II studies as the Project layout is developed.

### 8.19.5 DNR WATERFOWL FEEDING AND RESTING AREAS

There are no DNR designated waterfowl feeding or resting areas in Stearns County or in the project vicinity.

### 8.19.6 IMPORTANT BIRD AREAS WITHIN AND ADJACENT TO PROJECT BOUNDARY

There are no Important Bird Areas identified within or adjacent to the Project boundary.

## 8.20 RARE AND UNIQUE NATURAL RESOURCES

### 8.20.1 DESCRIPTION OF RESOURCES

There are no records of federally listed or candidate species in Stearns County, and there are no records of state-listed species within the Project boundary. The Tier I and II studies did not identify any designated critical habitat within the Project boundary; the results of the Tier I and II studies are included in Section 8.19.4.

The USFWS, the DNR Natural Heritage Program, and the DNR Division of Ecological Resources were contacted to review the Project for threatened and endangered species and unique habitats. Response letters from the DNR and the USFWS are included in Appendix E.

A conference call was held with representatives from the DNR and USFWS on July 21, 2009, and the call notes are included in Appendix E. The USFWS had limited comments on the Project at the meeting, but provided comments in their March 26, 2010 letter (Appendix E).

In a December 22, 2008, response letter, the DNR Natural Heritage Program indicated that there are several rare features that have been documented within a 1-mile radius of the Project boundary. These include the following:

- The Padua WMA, located southeast of the Project boundary. The DNR recommends a one-quarter mile turbine setback from all WMAs.
- The RSEA in the southeast portion of the Project boundary, in Section 13 of Raymond Township, associated with Raymond Lake and the Padua WMA.
- Breeding season observations (1997) of marbled godwit (*Limosa fedoa*), a state-listed bird of special concern, and the upland sandpiper (*Bartramia longicauda*) in the vicinity of the project.

Because WMAs and WPAs in the vicinity provide habitat during the breeding season and during migration for other bird species, the DNR recommends pre- and postconstruction avian monitoring.

Because the Project boundary was altered subsequent to the original agency consultation, a second letter was sent to the DNR on June 15, 2010. The revised Project boundary included two additional sections (one section to the west and one to the south) not included at the time of the original agency consultation. A response to the subsequent letter was received from DNR Division of Ecological Resources on July 6, 2010. The boundary has again been expanded since June 15th; new requests for comment were sent to the DNR (Natural Heritage Program and Ecological Services) and the USFWS on December 2, 2010, but responses have not yet been received. GWE is continuing to coordinate with the USFWS and the DNR.

The USFWS March 26, 2010, response letter included recommendations for pre- and postconstruction avian monitoring, and provided the following additional comments:

- They recommend that impacts to streams and wetlands be avoided and buffers surrounding these systems be preserved. Streams and wetlands provide valuable habitat for fish and wildlife resources, and the filtering capacity of wetlands helps to improve water quality. Naturally vegetated buffers surrounding these systems are also important in preserving their wildlife-habitat and water quality-enhancement properties. Furthermore, forested riparian systems (wooded areas adjacent to streams) provide important stopover habitat for migrating birds.
- The USFWS notes that both the Behnen and Trisko WPAs are within a half-mile of the Project, and in order to minimize interference with migratory bird flight paths, a half-mile setback from WPAs is generally recommended.
- They note a record of a bald eagle nest approximately 5 miles northeast of the proposed project site, and recommend that eagles be included in any preconstruction avian monitoring of the site.
- They recommend a habitat survey of the proposed project site to confirm whether suitable habitat exists for the upland sandpiper, marbled godwit, and sandhill crane (*Grus canadensis*). If habitat is found within the Project site, then the USFWS recommends breeding bird surveys to determine the utilization of the habitat.

The USFWS provided a list of Interim Service Guidelines as well as the above recommendations.

The DNR's July 6, 2010, letter noted that the site is located in an area of gently rolling topography in prairie pothole country, and that although much of the prairie within the Project area has been converted to crop land, there are numerous seasonal and semipermanent wetlands scattered throughout the site, along with hayfields and remnants of native grasslands. Specific observations and recommendations are as follows:

- The DNR recommends a 0.5-mile setback from the Padua WMA (and all WMAs), semipermanant wetlands, and other protected habitats (e.g., RIM easements) for all wind turbines.
- They provided a listing of bird species recorded in the Project Area by DNR staff, and provided a website link to the MBBA database.

- Wet prairie habitat was observed by DNR staff that they estimate to occupy about 240 acres in the NW quarter and the N half of the SW quarter of Section 11, Raymond Township. DNR recommends a thorough vegetative and avian assessment of this site if any turbines are proposed in this area.
- During a March 26, 2010, drive-by avian assessment of areas adjacent to the Project Area (in Sections 5, 6, and 18 of Getty Township), DNR staff observed Canada geese, mallards, horned larks, red-tailed hawks, killdeer, and northern harrier. On one seasonal wetland in Section 18, Getty Township, DNR staff observed 110 tundra swans, 60 Canada geese and more than 200 mallards and ring-necked ducks sitting on a seasonal wetland that was later found to be dry and planted to corn on June 23. Therefore, the DNR recommends that springtime wetland and waterbird surveys be conducted where NWI maps indicate potential wetlands in order to characterize seasonal waterbird use of the area.
- The RSEA covering the southeast portion of the project boundary in Section 13, Raymond Township, contains the Padua WMA.
- The DNR noted records of Powesheik skipper (*Oarisma powesheik*) and marbled godwit, both state-listed species of concern, in the general area, but not within the Project boundary.
- DNR recommended swan diverters on overhead transmission lines at all river/stream crossings and where overhead lines cross or come close to wetlands, lakes, and associated avian travel corridors.
- DNR recommended that springtime habitat assessments and one full year of pre-application avian and bat surveys be conducted prior to LWECS application, along with two years of postconstruction surveys.

The DNR maintains an NHIS database through their Natural Heritage Program and Nongame Game Wildlife Program, which is the most complete source of data on Minnesota's rare, endangered, or otherwise significant plant and animal species, plant communities, and other rare natural features (Minnesota DNR 2009c). NHIS data show that there are no state-listed species within the Project Area. Six state-listed species of special concern (two birds, one insect, two mollusks, and one plant) have been documented within 5 miles of the Project area (Table 8-19). In addition, this search area includes records of three bird species that do not have a legal status, but are being tracked by the DNR.

**Table 8-19. State Listed Species Recorded within Five Miles of Study Area**

| Type | State Status | Scientific Name | Common Name | No. of NHIS Records within Study Area | No. of NHIS Records within Five Miles of Study Area Boundary | Year of Most Current Observation | Habitat Type Described in NHIS Data |
|---|---|---|---|---|---|---|---|
| Bird | SPC | *Haliaeetus leucocphalus* | Bald Eagle | -- | 1 | 2004 | Nesting area near Sauk Centre, MN |
| | SPC | *Limosa fedoa* | Marbled Godwit | -- | 2 | 1997 | Variable habits including: degraded prairie/ grassland/ marsh complex, cultivated fields, and old fields |
| | NON | *Bartramia longicauda* | Upland Sandpiper | -- | 4 | 1997 | Old field and recently planted prairie; cultivated field; mowed field |
| | NON | *Botaurus lentiginosus* | American Bittern | -- | 1 | 2002 | Marshland |
| | NON | *Grus canadensis* | Sandhill Crane | -- | 1 | 2002 | Oldfield/ prairie and marshes |
| Insect | SPC | *Oarisma powesheik* | Powesheik Skipper | -- | 1 | 1997 | Planted prairie with leadplant and purple coneflower |
| Mollusk | SPC | *Lasmigona compressa* | Creek Heelsplitter | -- | 1 | 2001 | Sauk River |
| | SPC | *Ligumia recta* | Black Sandshell | -- | 1 | 2001 | Sauk River |
| Plant | SPC | *Cypripedium candidum* | Small White Lady's Slipper | -- | 3 | 1999 | Mesic prairie |
| | SPC | *Panax quinquefolius* | American Ginseng | -- | 1 | 2002 | Forested slope among sugar maple and basswood |

*E=Endangered; T=Threatened; SPC=Special Concern; NON=Tracked, but no legal status*
*Source: DNR NHIS Data, 2008.*

### 8.20.2 IDENTIFY NATIVE PRAIRIE WITHIN OR ADJACENT TO PROJECT BOUNDARY

As part of its NHIS database, the DNR also maps rare and unique plant communities. These records may represent relatively rare habitats (e.g., prairie) or higher quality or good examples of more common plant communities (e.g., wet meadow). While most native plant communities have no legal protection in

Minnesota (DNR 2009c), these areas may have the potential to contain undocumented populations of rare plant species. Many of these native communities also provide essential habitat for rare species of fauna, such as those listed in Table 8-20.

No native plant communities are recorded within the Project Area. Table 8-20 summarizes the native plant communities recorded within 5 miles of the Project Area.

**Table 8-20. Native Plant Communities Recorded within 5 Miles of Project Boundary**

| Native Plant Community Type | No. of NHIS Records within Five Miles of Project Boundary |
|---|---|
| Cattail Marsh | 1 |
| Mesic Prairie Southern | 3 |
| Wet Meadow | 2 |

*Source: DNR NHIS Data, 2008*

## Impacts

Based on preliminary site assessments, the Project Area is mostly cropped or pastured. No records of state-or federal-listed species, designated critical habitat, or rare vegetation communities occur within the Project boundary. As discussed in Section 5.18, a portion of an RSEA with the highest quality ranking (3) is located in the Project Area; this area will be avoided. One area of wet prairie was observed by the DNR within the Project boundary; through coordination with participating landowners, GWE has determined that this parcel is in CRP. It is therefore possible that the planted grassland will be turned back into agricultural production once the CRP contract expires. No impacts to rare or unique natural resources are anticipated from the project.

The bald eagle nesting site, located approximately 5 miles northeast of the Project Area near the City of Sauk Rapids, is situated among numerous WPAs and WMAs. The landscape between the Project Area (and areas west of the Project Area) and the nesting site does not represent high-quality foraging habitat for the species, whereas areas between the Project area and the nest and points east are high quality habitat. No distinctive topographic features, land cover, or habitat exists that would preferentially draw bald eagles into the Project Area. Also, because the known bald eagle nesting site is located nearly 5 miles to the east of the Project boundary, impacts to the nest are not anticipated. A preconstruction inventory of existing native prairie, woodlands, and wetlands will be conducted in the Project Area. The Applicant will avoid the rare and unique resources identified to the extent practicable.

## Mitigative Measures

The Applicant will implement the following measures to avoid potential impacts to federal- and state-listed species and rare or sensitive habitat in the area during site selection for the wind turbines and access roads and the subsequent Project development and operation:

- Conduct a preconstruction inventory of existing biological resources, native prairie, and wetlands in the Project Area
- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction

- Avoid or minimize placement of turbines in high quality native prairie, including the wet prairie noted by DNR staff
- Avoid the RSEA
- Setback the turbines from the WPAs and WPAs in adjacent properties by at least one-quarter mile because of the Project perimeter setback
- Continue to coordinate with the USFWS and DNR as the Project layout is developed

### 8.20.3 REGULATORY ENVIRONMENT

**Federal Regulations**

*Endangered Species Act*

Section 7 of the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544) requires that all federal agencies consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats, which may result from their direct, regulatory, or funding actions. USFWS is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 7 of the ESA also prohibits the taking of any federally listed species by any person without prior authorization. The term "taking" is broadly defined at the federal level and explicitly extends to any habitat modifications that may significantly impair the ability of that species to feed, reproduce, or otherwise survive. While the prohibition of “taking” federal species applies to anyone, the prohibition of the destruction or adverse modification of designated critical habitat only applies to federal agencies.

*Bald and Golden Eagle Protection Act*

While the bald eagle has been recently delisted from the ESA, it is still protected by the MBTA and the Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. 668-668d). The BGEPA makes it illegal to kill, harass, possess (without a permit), or sell bald eagles.

**State Regulations**

Minnesota’s endangered species law (MN Statute 84.0895) and associated rules (MN Rules 6212, 1800, 2300, and 6134) regulate the taking, importation, transportation, and sale of state endangered or threatened species. The DNR administers the state list of rare, threatened, and endangered species.